25 AUGUST 1955 ONE SHILLING

ELECTRICAL TIMES

'ENGLISH ELECTRIC'

h.r.c. fuse links

THE ENGLISH ELECTRIC COMPANY LIMITED, QUEENS HOUSE, KINGSWAY, LONDON, W.C.2.

Fusegear Division, East Lancashire Road, Liverpool 10

FG.25HS WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

WYLEX

SWITCH FUSE CONTROL UNITS

1 WAY

2 WAY

3 WAY

4 WAY

6 WAY

8 WAY

THE WYLEX ALL-INSULATED RANGE

Easy fixing; robust construction; superlative finish—these are the reasons why customers repeat their orders for Wylex Units again and again.

METALCLAD OR ALL-INSULATED
REWIRABLE OR H.R.C. CARTRIDGE FUSES
ANY COMBINATION OF 5, 15 OR 30 AMP.

● Also available in Metalclad

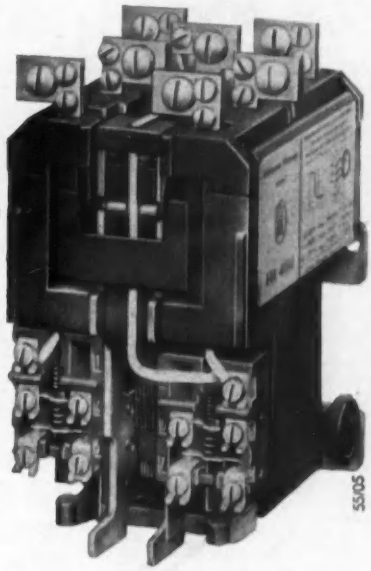
Write for Catalogue to :—

George H. Scholes & Co. Ltd.
Wylex Works, Wythenshawe, Manchester, 22

WYLEX

'Must be Good'

Contactor DIL 4/52
with a contact life of
ten million cycles of operations
with a motor output of 15 HP at
380/500 V and of
three million cycles of operations
with a motor output of 30 HP at
380/500 V



Contactors with Machine Life Span

Electrical controlgear is an integral part of modern production machines. Messrs. Klöckner-Moeller are the only manufacturers in this line whose controlgear has a life equal to that of the machine it controls, meaning no maintenance nor exchange of contacts.

This signifies at least 10 years of trouble-free service and in consequence a considerable saving of unproductive costs for repairs and dead periods.

We invite your requests for detailed descriptions of this economic gear.

Original
KLÖCKNER-MOELLER · BONN

Representatives: Messrs. W. R. VAUGHAN LIMITED
Industrial Representatives
4 Queen Street · Curzon Street
LONDON W 1
Telephone GROsvenor 1571-2

Make a note to visit our STAND No. 15
Outer Row Gallery, National Hall.

A

One way and another

SANTON "BEAVER"

immersion heaters can be fitted with either the famous Santon "Otter" fixed setting thermostat or one of the stem type.

This entirely new development now makes it unnecessary for suppliers to stock heaters for each type of thermostat and enables full advantage to be taken of the growing popularity of the Santon "Otter" fixed setting thermostat.

SANTON

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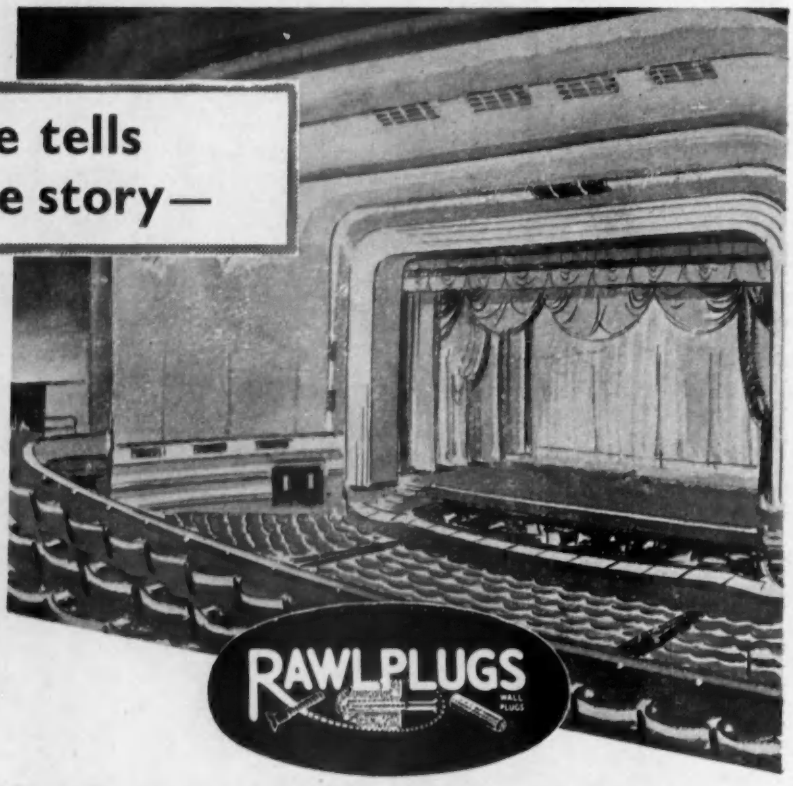
Telephones: Newport 71711. Manchester Cen. 1394/5. London Shepherds Bush 3311/2
Birmingham Mid. 6421. Newton Abbot 1638. Leeds 28762

We are exhibiting at the Engineering Marine & Welding Exhibition, Stand K4, Olympia—September 1-15.



Every picture tells a complete story—

When the crowd leaves the cinema no one—except perhaps *you*, the contractor!—wonders about how the seats, the electrical and heating installations and the rest are fixed. There's a complete story here behind the scenes, a story of absolute efficiency—Rawlplug Fixing Devices holding firm in a hundred different fixing jobs. Every one of those screw and bolt fixings was completed far more speedily with Rawlplug Fixing Devices. They will save *you* time and money too!

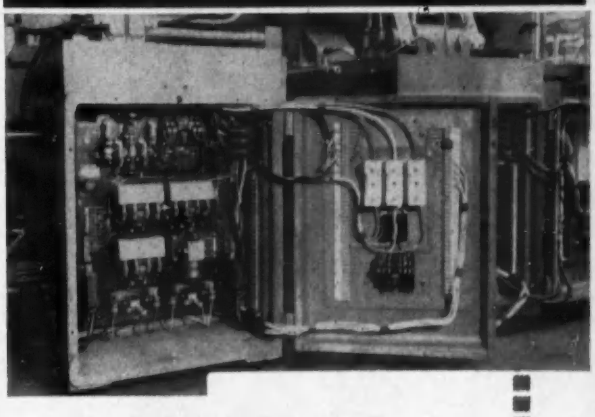
Write our Technical Dept. about your fixing problem.

RAWLPLUGS

THE RAWLPLUG COMPANY LTD CROMWELL ROAD · LONDON · S W 7 **THE WORLD-WIDE FIXING DEVICES ORGANISATION**

DONOVAN

The ELECTRIC CONTROL GEAR *for* AUTOMATION



One of the 18 Auxiliary Panels

Photographs show

CYLINDER HEAD TRANSFER MACHINE at the **AUSTIN MOTOR COMPANY'S WORKS, BIRMINGHAM,** equipped with **DONOVAN ELECTRIC CONTROL GEAR**

The Transfer Machine shown is completing a sequence of operations on cylinder heads for the 1,200 and 1,500 c.c. engines. There are 18 working stations and 18 heads for drilling, reaming and tapping. Production is continuous over a 17-hour day, and we are proud of the fact that the DONOVAN electric control gear gives unfailing performance in an atmosphere with high cast iron dust content.

We specialise in electric control gear for machine tools. Let us co-operate in YOUR programme for Automation.

THE DONOVAN ELECTRICAL CO·LTD
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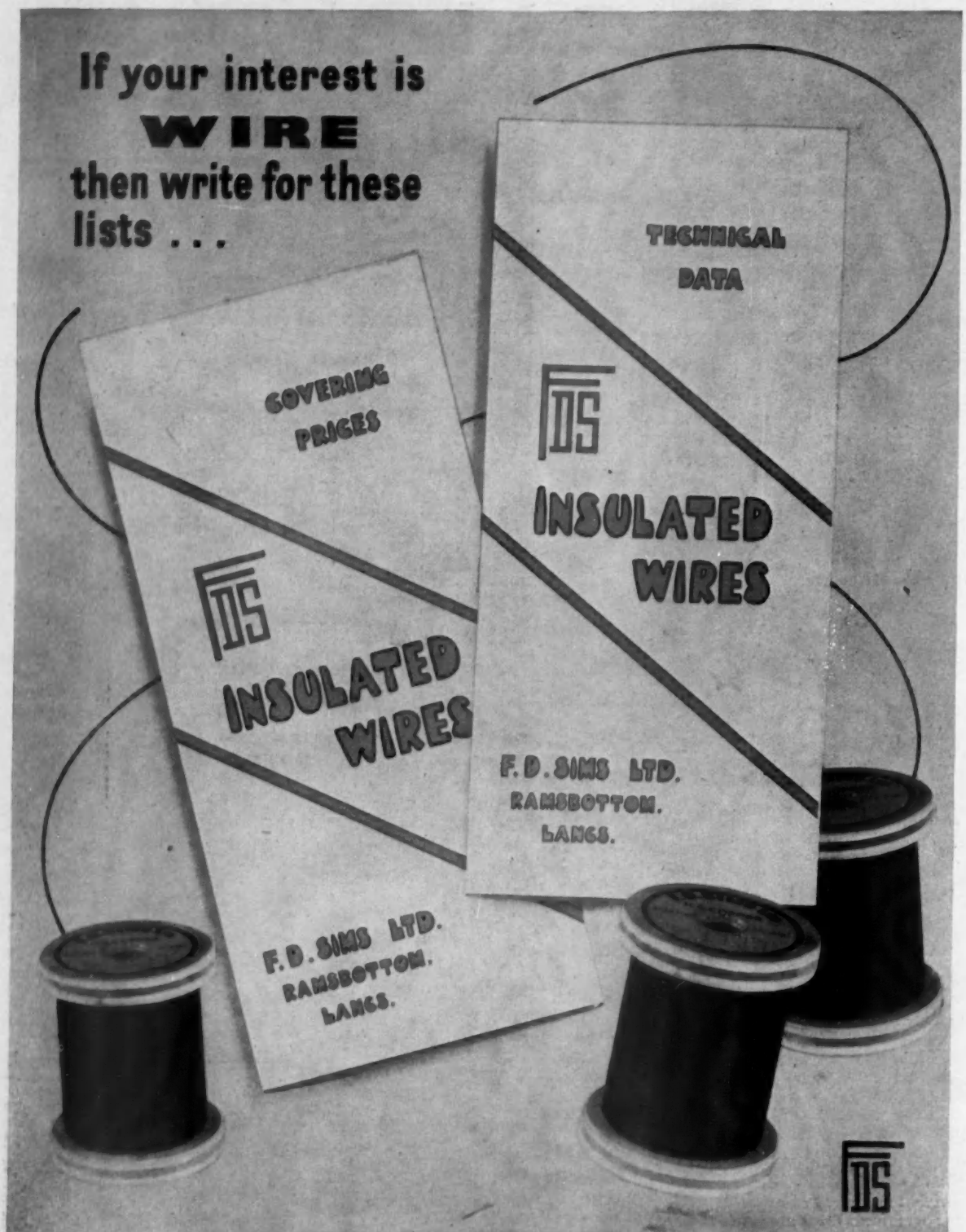
GLASGOW DEPOT: 27, PITT ST., C.2

Sales Engineers available in London, Birmingham, Manchester, Glasgow Belfast, Bournemouth

A*



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Telephone: RAMSBOTTOM 2213-4-5
Telegrams: SIMS RAMSBOTTOM
London Office: 95 WESTMORELAND ROAD - BROMLEY - KENT
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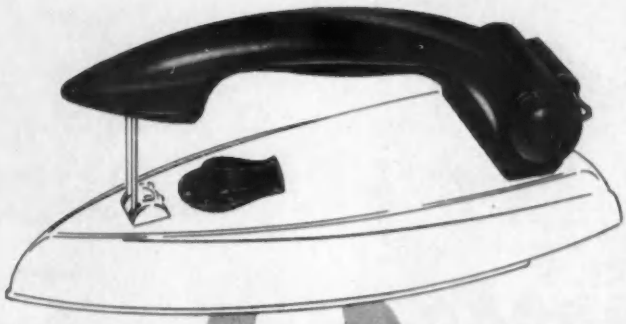
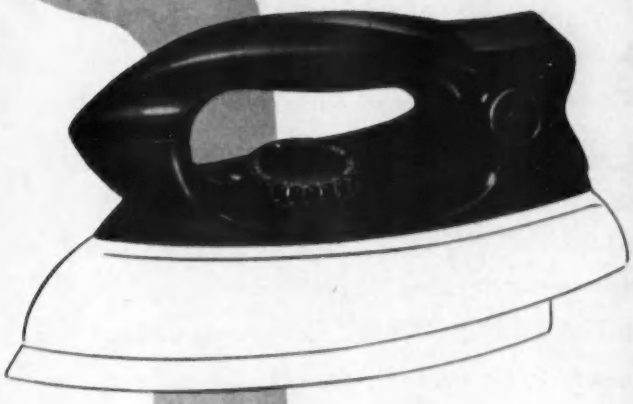
F.D.SIMS LIMITED

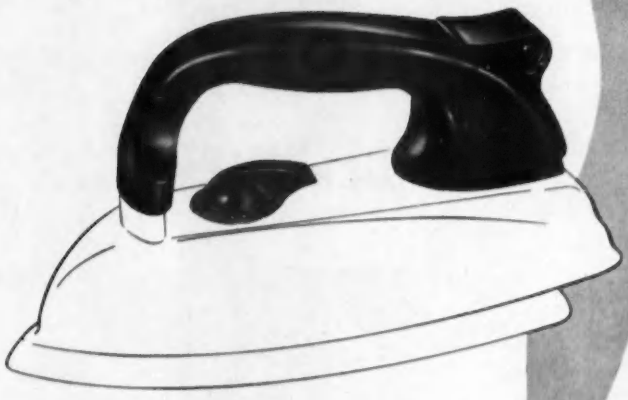
581 (R)



MOULDINGS

Large quantity production of these Morphy-Richards iron handles goes very smoothly . . . Perhaps we can mould some of your components?

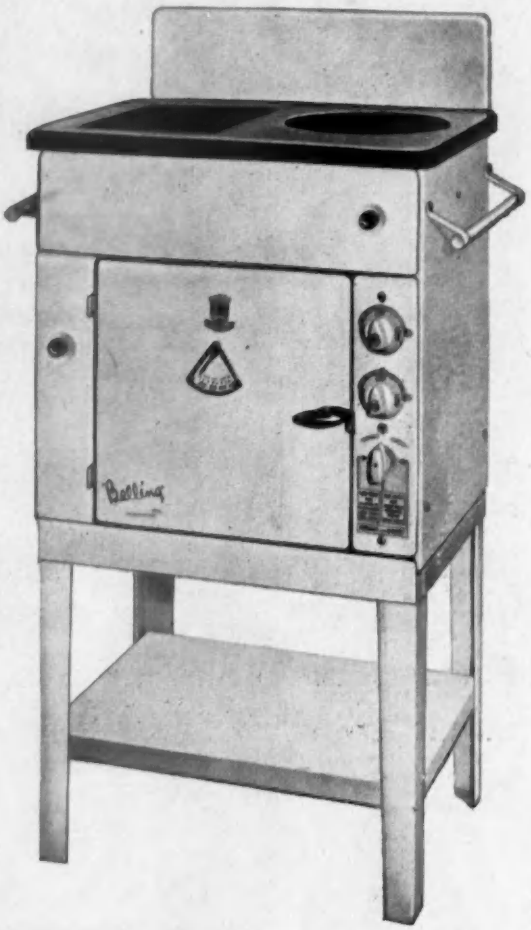




Over the years we have moulded **millions** of iron handles and other plastic components for Morphy-Richards irons—irons that sell at a reasonable price and are famous for their advanced functional design and fine finish. Cosmocord specialise in the production of the better class of plastic components for the electrical and radio industries. Prices are competitive and deliveries good.

COSMOCORD LIMITED
(Plastics Moulding Division)
Cambridge Road, Enfield, Middlesex
Phone: Enfield 4022

BIG BABY "BELLING" sales ahead



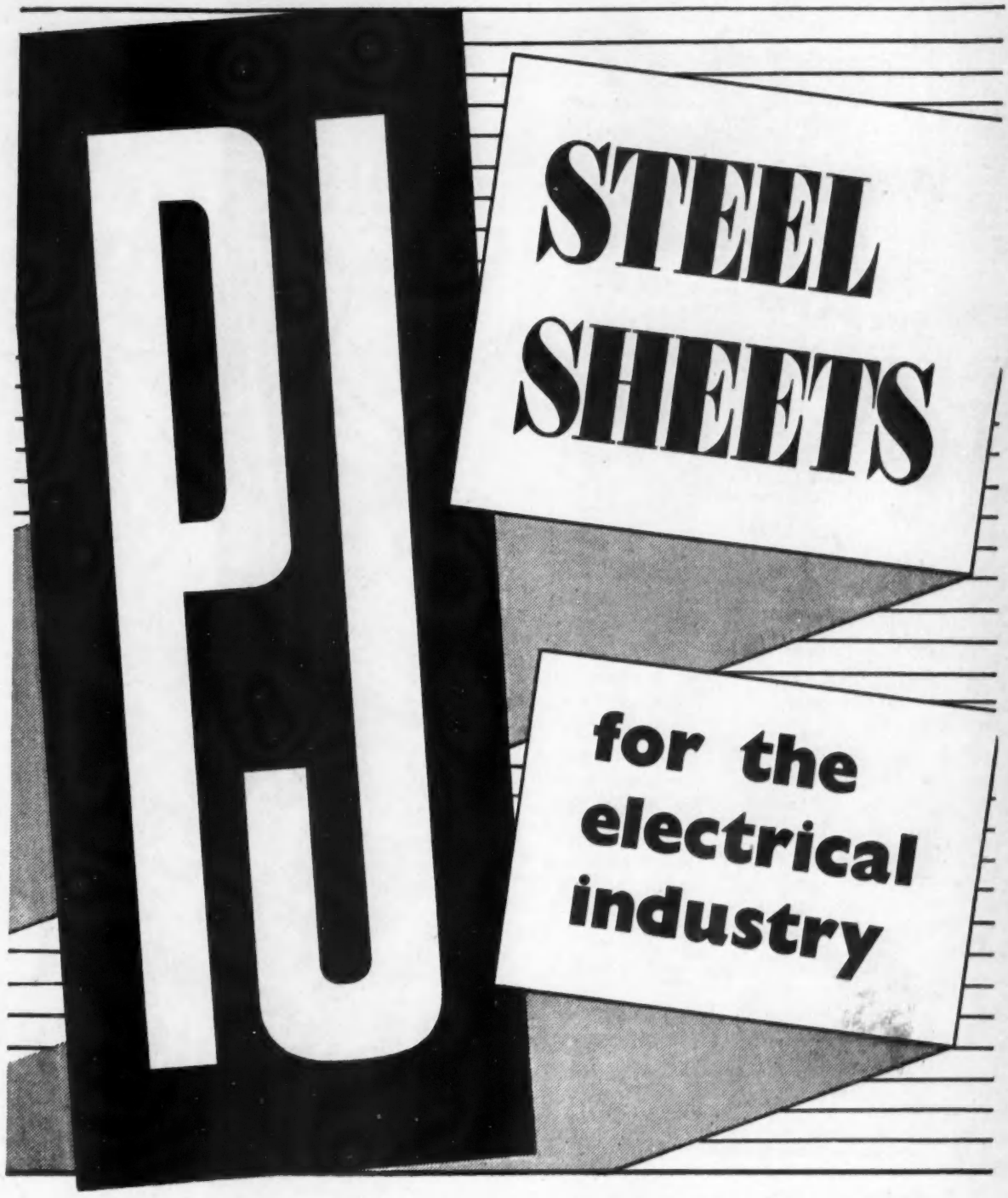
There will certainly be very big Big Baby Belling sales ahead. Production on our new assembly lines is rapidly increasing and the delivery position is getting better and better. The demand for the Big Baby has exceeded all expectations. No wonder—it has the cooking capacity of a full size cooker yet will work off any power point * and costs only £19.17.6d. The independently heated oven produces roasting and baking that's second to none in its class. In fact the results from this splendid cooker compare favourably with any cooker at any price.

* *Patent interlocking device limits current automatically so that the cooker can be safely operated from a 13 amp power point.*
- *Large independent extra quick heating oven. Thermostat available 35/- extra.*
- *8" solid type boiling plate and combined grill-boiler.*
- *Large hotcupboard for plates and food.*
- *Useful plate warming compartment beside oven.*
- *Supplied on Stand with utensil shelf—also available with 2-door Cabinet, 40/- extra.*
- *Handy Towel Rail on either side of oven.*
- *£19 · 17 · 6 including Stand—subject to usual Baby Belling discounts.*

you can't beat a "Belling"

Belling & Co. Ltd. Bridge Works. Enfield. Middx. Howard 1212

CBC 430



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Telephone: Pontypool 131/2

RADIOVISOR
EST. 1927

PHOTO-ELECTRIC PYROSTAT

THE ONLY METHOD OF
Instantaneous
AUTOMATIC CONTROL
for eddy-current
and direct
resistance heating

The problems of incorrect heating brought about by variations in electrical current, differences in the size of work-pieces, bad contact resistance, etc. are entirely eliminated. The Radiovisor Pyrostat Control is operated only by the light radiations from the heated body and is unaffected by intense heat. Once the Pyrostat is set the heating current is switched off immediately the pre-set desired temperature is reached—and will maintain an 'on-off' operation indefinitely without further attention.

This simple Receiver houses the photo-electric cell which eternally watches the job without any direct contact with the heated work-piece-clear of the operator and operation.

Other Radiovisor Photo-electric and Electronic controls include:

Flamestat Flame Failure Control
Smoke Alarm and Recorder
Invisible Ray Burglar Alarm
Hopper & Bunker Level Control
Photo-Electric Safety Guard
Automatic Radiation Pyrostat
Smoke Detector Fire Alarm
Counting & Batching Unit
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The first name in Photo-Electric Controls

Hackbridge Cables

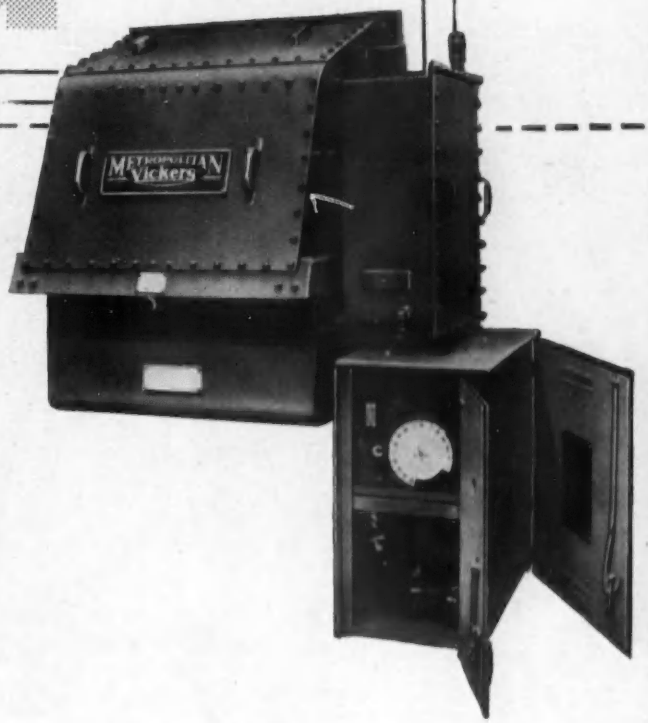
for every purpose

Contractors to the G.P.O., National Coal Board, British Railways, C.E.A. and British and Colonial Government Departments.

HACKBRIDGE
Cable Company Limited
KELVIN WORKS · HACKBRIDGE · SURREY
In Association with Bryce Electric Construction Company Ltd.

On-load Tap Changers

TYPE M



Designed for use on transformers of up to 275 kV, the Type M tap changer has a simple and reliable operating mechanism which ensures completion of tap change. Transition resistors—liberally rated and mechanically robust—minimize arcing and burning at the contacts of the diverter switches, and ease the switching duty. The complete tap changer with its motor driving gear is compactly assembled as a single, iron-clad unit and bolted to a flange on the transformer tank.

Other important features:

- *Any number of steps up to 18 can be accommodated*
- *Once initiated, a tap change cannot be interrupted*
- *Continuity of supply maintained during a tap change*
- *Separate drop-down tank allows convenient inspection of diverter switches*
- *Diverter switches are rapid in operation*
- *Contact bounce at diverter switches eliminated*
- *Minimum voltage variation during a tap change*
- *Moving contacts have single bolt fixing and are accessible from the front.*

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

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Leading Electrical Progress

E/A508

TRADE MARK

HIGGS MOTORS LTD.

MANAGING DIRECTOR DAVID C.Y. HIGGS. A.M.I.E.E.

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HIGGS POLISHING MOTORS
from stock
Pedestal or Bench Mounting
GUARANTEED for EVER

Belfast · Bristol · Cardiff · Dundee · Glasgow · Hull · Leeds · Liverpool
London · Manchester · Newcastle · Peterborough · Sheffield · Wolverhampton

PUZZLE:-

find the gear

Don't worry about it too long – there isn't any gear. Not a choke anywhere. Not a single P.F. capacitor. Not a starter. For with Philips "Gear-less" Fluorescent Lighting all that's needed is a fluorescent lamp in series with a tungsten lamp! It's as simple as that.. yet what a magnificent light it gives!

Philips "Gear-less" Lighting is three times lighter in weight than standard fluorescent lighting–yet costs only half as much. And that means it's suitable for all sorts of fresh applications.

Get in touch with Philips right away!

So many sales features

- *Lowest priced fluorescent lighting*
- *Fluorescent lamp and filament lamp can be fixed separately or together, as desired*
- *Absolutely noiseless in operation*
- *Very light in weight*
- *No control gear or starter switch required*
- *With Deluxe Warm White lamp gives perfect colour rendering for the display of food*
- *Light equal to two 100 watt filament lamps for only 115 watts.*

"GEAR-LESS" FLUORESCENT LIGHTING

from PHILIPS

PHILIPS

PHILIPS ELECTRICAL LTD · LIGHTING DIVISION · CENTURY HOUSE · SHAFTESBURY AVE · LONDON WC2

TUNGSTEN, FLUORESCENT, BLENDED AND DISCHARGE LAMPS & LIGHTING EQUIPMENT · RADIO AND TELEVISION RECEIVERS, ETC. (LD819)

THERE'S *nothing* LIKE CHEMICO

The SAFE, certain cleaner for all electric cookers

Chemico shifts grease and dirt like lightning and with so little effort too. And Chemico is so safe and gentle — it won't scratch glossy paint surfaces or harm your hands. Chemico comes in 1 lb. and 2 lb. tins and 28 lb. buckets — and it's a paste: there's no waste.

CHEMICO

NOW SOLD IN 74 COUNTRIES

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THE COUNTY CHEMICAL CO. LTD. • SHIRLEY • BIRMINGHAM

It's METALLIC —we'll soon finish the job

In factory and school, in hospital or housing estate, the electrical installations as often as not embody 'conduit and fittings by METALLIC'. Why is this? It's because architects and contractors alike know that METALLIC is really long-lasting. It's solidly made from the best materials and finished to resist moisture, chemicals, etc. Its consistent accuracy too cuts installation time to a minimum *and* avoids wastage.

All over the world you'll find Conduit and Fittings by

A TI COMPANY METALLIC

THE METALLIC SEAMLESS TUBE CO. LTD., LUDGATE HILL, BIRMINGHAM, 3.

and at London, Newcastle-on-Tyne, Leeds, Swansea & Glasgow.

Cut 20% off volume, weight and price!

Highly efficient, easily maintained and competitively priced the new Brush Square Path Alternators are designed *exactly* to meet the needs of modern industry. They are built in a wide range of sizes with outputs from 1½ to 35 kVA, self regulating, self exciting. Compared with orthodox alternators with overhung exciters they have higher efficiency, lighter weight and smaller dimensions. Brush Engineers are specialists in designing self regulated alternators (1½ to 35 kVA) and externally regulated alternators (1½ to 32 kVA) as reliable components for generating sets. And all Brush built alternators can be bought complete with Control Switch Gear. Write today for our latest catalogue and publications.

You get exactly what you want from **BRUSH**

BRUSH ELECTRICAL ENGINEERING COMPANY LIMITED, HOPKINSON WORKS, CARDIFF. MEMBER OF THE BRUSH GROUP

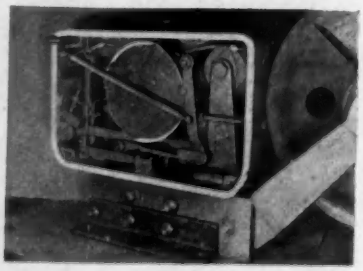
add a little

SWITCHCRAFT

to your MECHANICAL HANDLING problem

BURGESS MICRO-SWITCHES are used in manifold ways by a large number of manufacturers of mechanical handling equipment. A good example is to be found in the Automatic Safe Load Indicator Mk. 3 here illustrated (with front cover removed) which is fitted by Steels Engineering Products Limited to many of their "Coles" mobile cranes.

This ingenious unit safeguards both operator and machine by "cutting out" the hoisting and derricking-out motions when a load becomes unsafe. It also provides warning of the approaching "cut-out" position so that the operator may ascertain the maximum safe radius of the derrick for the respective load. These facilities are provided by type CRS BURGESS MICRO-SWITCHES mounted in the unit and operated by levers in the manner evident from the photograph.



The type CRS BURGESS MICRO-SWITCH is a sensitive model provided with a spring plunger actuator. Full details of this and many other models are to be found in our CATALOGUE No. 50/D.

BURGESS MICRO-SWITCHES

Industry's Automatic Choice

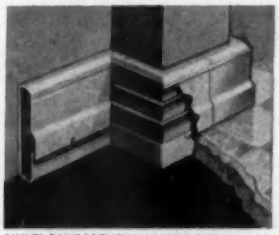
BURGESS PRODUCTS COMPANY LIMITED, Micro-Switch Division, Dukes Way, Team Valley, Gateshead 11. Telephone: Low Fell 75322 (3 lines).

PLAN AHEAD for electrical energy on tap

The "WALSALL" Underfloor—Floor—Wall and Skirting Trunking Systems are designed to meet the constantly increasing demand for FLEXIBILITY in the layout of Electrical Installations in Modern Buildings.

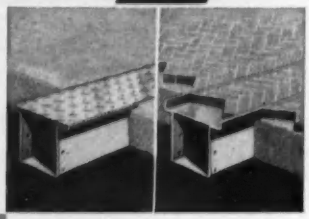
These systems enable the electrical installation to be planned in advance without regard to the position of fixtures, furniture and equipment.

It provides for immediate requirements and future extensions with Electricity "on tap" at almost any point for Light, Power and Telephone Services.

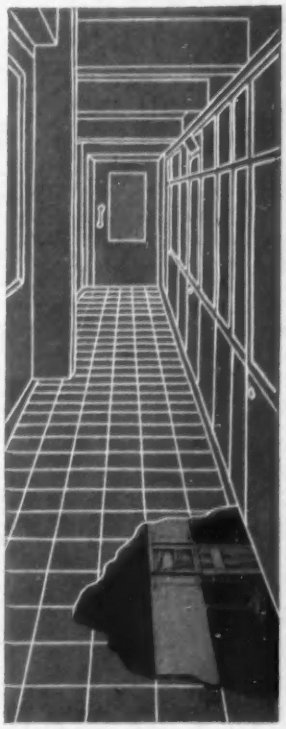


MULTI COMPARTMENT SKIRTING TRUNKING

HOSPITALS



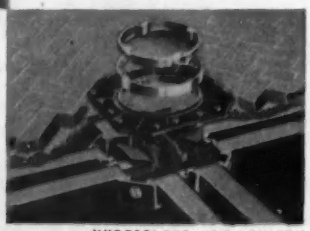
SCHOOLS



SHALLOW SCREEDUCT

COMMERCIAL BUILDINGS

- *Bus-Bar Trunking*
- *Cable-Tap Trunking*
- *Hospital Trunking*
- *Overhead Trunking*
- *Wall Trunking*
- *Weatherproof Trunking*



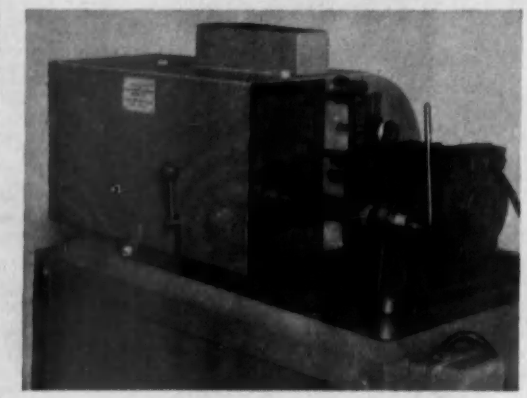
UNDERFLOOR DUCT SYSTEM

Walsall

CABLE TRUNKING & DUCT SYSTEMS

WALSALL CONDUITS LTD
WEST BROMWICH

How to cut Rewinding costs



BARNABY
Rewinding Machines

Types A and B

Here are two machines deliberately designed to cut costs in Rewinding and at the same time to increase efficiency. One of the world's leading Wire and Cable Manufacturers co-operated in their origin with the result that they have been *proved in production to increase efficiency and to effect substantial savings in the finished product.* This is a big step forward, especially in multiple end re-winding, where quality tells so much.

Single or multiple end rewinding. Wide range of bobbins up to 4½" dia. × 4½" traverse (Type A) and up to 10" dia. × 6" traverse (Type B). Cam controlled traverse for even winding.

No Shut-downs due to wire ends in gears or clutches

We can supply Re-Winding Machines, Ceiling Heads, Pay-Off Stands, Wire Swifts, Wire Tinning Machines, the Cable Measuring Machines and Plastic Extruders.

Send for Publication No. M. 102

SOLE SELLING AGENTS:

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Division of Catmur Machine Tool Corporation Ltd

103 LANCASTER ROAD, LADBROKE GROVE, LONDON, W.11. Phone: 9451/2

OUR EXPERTS ARE ALWAYS WILLING TO DISCUSS THE PROBLEMS OF MAKING THINGS AUTOMATIC.

Some of them will attend our stand No. 10 AA at the **Engineering, Marine and Welding Exhibition**, Olympia, London (First Floor, Empire Hall).

YOU ARE WELCOME

to try to checkmate them.

Danfoss Manufacturing Company

69, VICTORIA STREET,
LONDON, S.W.1, Telephone: ABBey 3587

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Reliability

TECHNICAL ADVISORY SERVICE — EARLY DELIVERY

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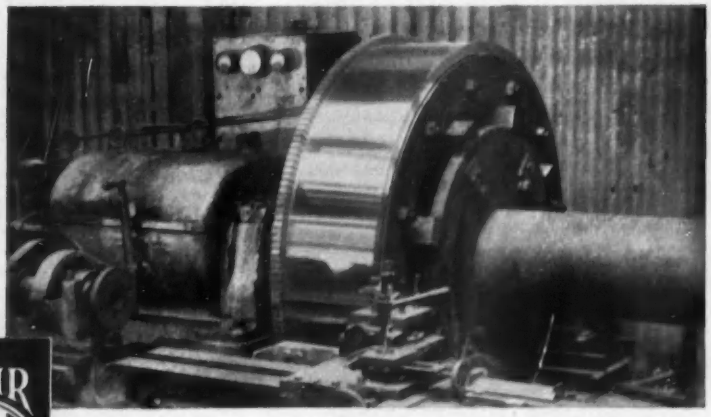
SELENIUM METAL RECTIFIERS

AUTOMAT CO. 366 MOORSIDE ROAD, SWINTON, NEAR MANCHESTER. TELEPHONE: SWINTON 2765.

CW.3157

Commutators . . .

We shall be pleased to have enquiries for the production of commutators up to a maximum of 10 ft. in diameter over the risers. B.E.R.L. Service is comprehensive in dismantling and repair or manufacture, erection and testing—and it is speedy. We remove defective commutators from machines in situ and fit and connect replacements. There are 14 B.E.R.L. Works, and the District Manager in your area is at your service. Ask B.E.R.L. to quote for your next job; in the meantime, write for a copy of our latest leaflet.



Illustrated are two stages in the manufacture of a 6 ft. diameter solid riser type commutator. The Photographs show (top) the machining of the Vees and (bottom) after machining of the brush surface diameter.

REPAIR B.E.R.L. SERVICE

BRITISH ELECTRICAL REPAIRS LIMITED,
EMPIRE HOUSE, CHARLOTTE ST., MANCHESTER 1

Works at: BATH, BIRMINGHAM, CARDIFF, CHESTERFIELD, EDINBURGH, GLASGOW, HAWICK, LONDON, MANCHESTER, NEWCASTLE, SWANSEA

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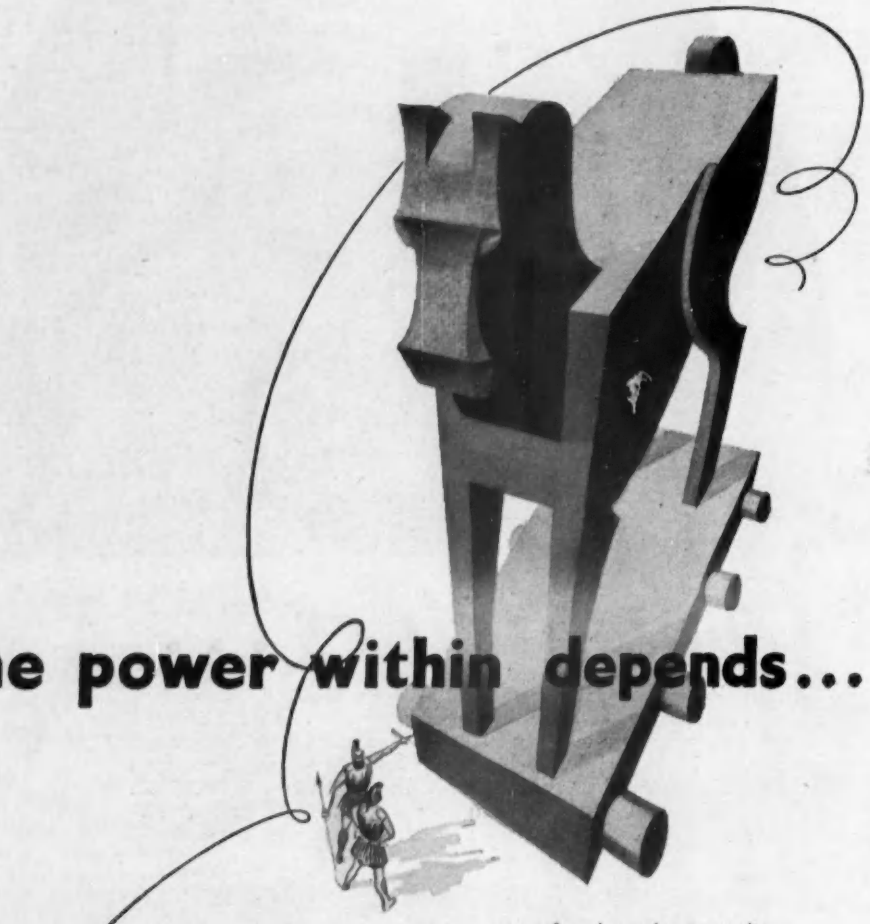

The power within depends...

...on safe and complete protection.

For over 60 years, Connollys' Winding Wire has gone out all over the world to serve the electrical industry for a thousand and one useful and efficient purposes. Now, with an even more up-to-date factory to serve our increasing number of satisfied clients, our products are acknowledged everywhere as the best of their type. Your enquiries will be welcomed. Samples gladly supplied on request.

The largest manufacturers of fine enamelled wire in the world.

CONNOLLYS *Winding Wires*

CONNOLLYS (BLACKLEY) LIMITED

Kirkby Industrial Estate, Liverpool

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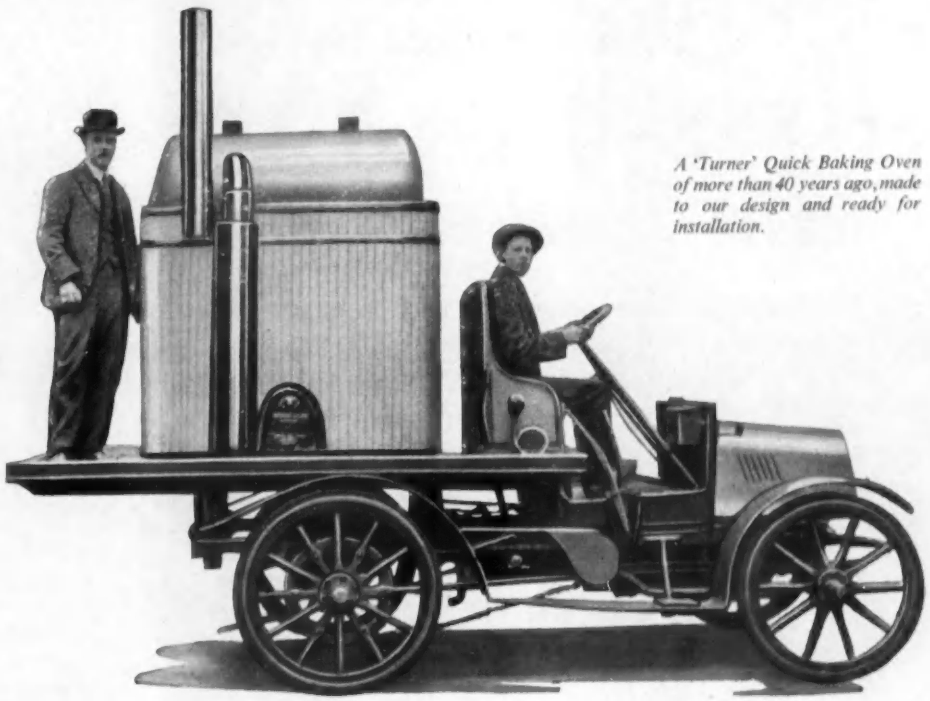
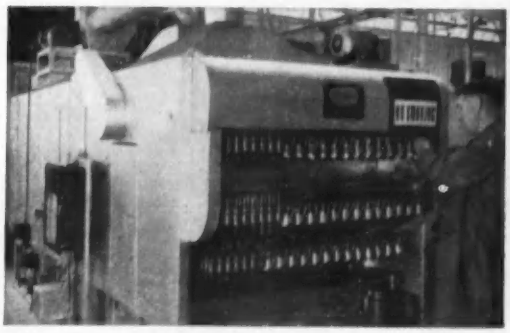


A 'Turner' Quick Baking Oven of more than 40 years ago, made to our design and ready for installation.

We started it

and not only the, er—vehicle ! Over 60 years ago STERLING began to specialise in the production of insulating varnish, culminating today in a world-wide service. Varnish manufacture, whilst still the basis, is now but a part—STERLING Chemists and Engineers give a complete service to the large or small user. They ensure that the best type of varnish is made for your needs and that it is applied by the most efficient and economic plant. You are invited to make full use of their services.



A typical up-to-date STERLING installation—impregnating 20,000 field coils and armatures per week by the cold dip and bake process, at Messrs. S. Smith and Sons (Eng.) Ltd.

Sterling
INSULATING
VARNISHES

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Telephone: TRA 0282 (4 lines) Telegrams: "DIELECTRIC, MANCHESTER"

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"ASHLAM" Laminates are produced from paper, cotton fabric and fibreglass base materials. The fibreglass grades are bonded with Silicone, Melamine, Phenolic and Polyester type resins, and have very high dielectric and insulation properties.

"ASHLAM" Laminates are also available in the form of tubes with fibreglass base bonded with Polyester and Silicone resins.

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You get a QUICK RETURN with this new CARRON trio

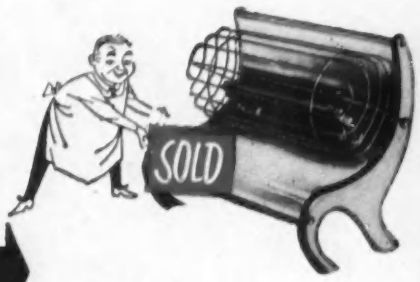
"L3" Three Plate Electric Cooker

A compact modern cooker with thermostatically controlled oven, grill-boiler and two solid hot-plates. The oven is fitted with a single plug-in element of special finned sheath type*—positioned at the bottom of the oven under a removable base pad. Cooking capacity: 2,656 cu. in. Grill chamber supplied with deflector plate and adjustable grill pan and grid. Cooker is constructed in cast iron and mild steel for durability and easy cleaning. Hob is hinged. Total loading 7,200 watts. Cooks for 8 people. *(*patent applied for)*

A similar cooker in the " L" series, but designed to cook for 4-6 people is the " L.2 ". This is identical with " L.3." in design and size, except that it has one solid hot-plate instead of two. Total Loading 6,200 watts.

"L2" Two Plate Electric Cooker

An entirely new radiant electric fire attractively designed to harmonise with contemporary or traditional furnishings. The " Curtsey " is strong and robust yet light in weight and transportable. Fitted with heavily plated fixed reflector, and efficient safety guard. Available in a range of 5 lovely CARRONTINE finishes. Loading 1 kW or 2 kW.



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we don't want to be big headed about it-

—but we feel sure you will forgive us for claiming, in all due modesty, to be well *ahead* of all competitors in the production of Immersion Heaters.

Take our newest development :

They do say. "Pat a man on the back and his head swells." Well, in our case we are patted on the back because our head has been reduced to about half normal size.

This reduction in the size of the terminal cover is the latest attractive feature of the **"SLIMROD,"** a single-pocket Immersion Heater designed to "fit the pocket" of all.

There are four lengths for vertical fixing through the top dome of a hot water cylinder, and two lengths for inserting through the side of a tank or cylinder.

Leaflet No. 81 gives fullest details of the **"SLIMROD."**

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Manufacturers of Electric Water Heaters, Oil Heaters, Immersion Heaters, Urns, Towel Rails, Electric Fires, Breakfast Cookers, Flameproof Heating Apparatus, Airing Cupboard Heaters, Food Trolleys, Warming Plates, Air Heaters, etc.

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I.C.I. silicone resins, rubbers and fluids have outstanding properties which enable them to solve many problems in the electrical industry

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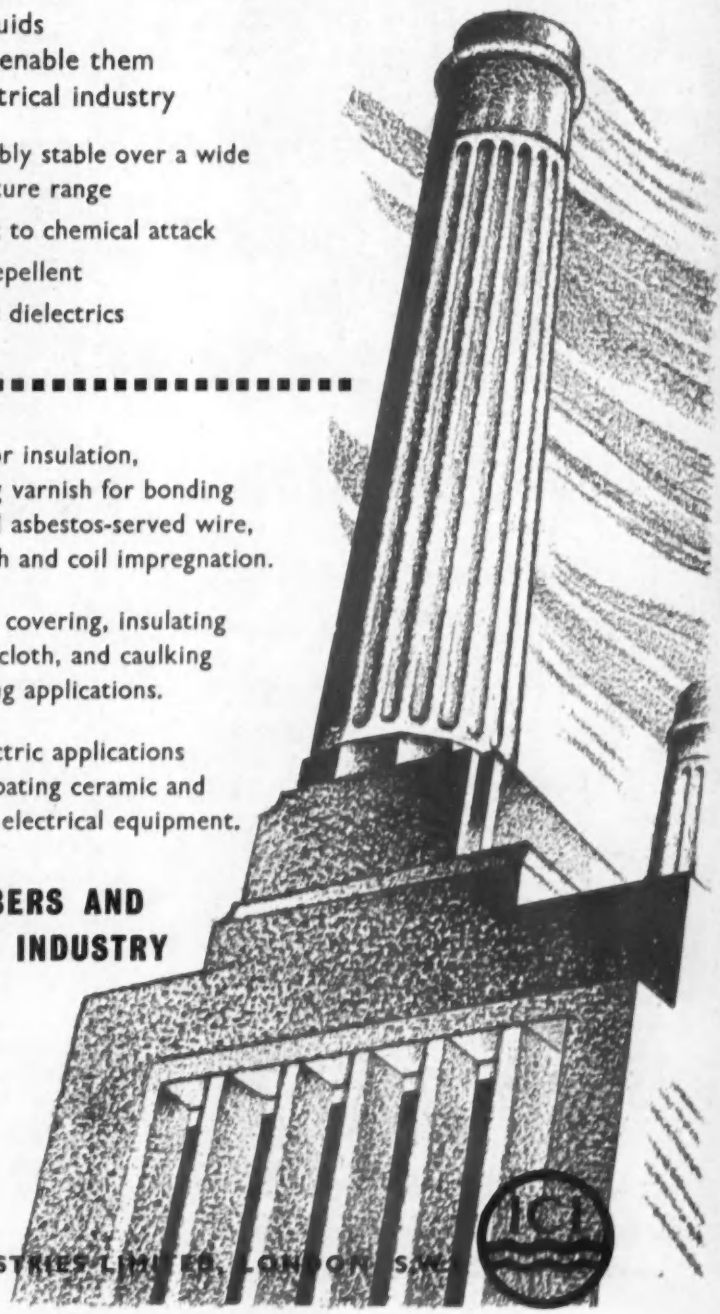

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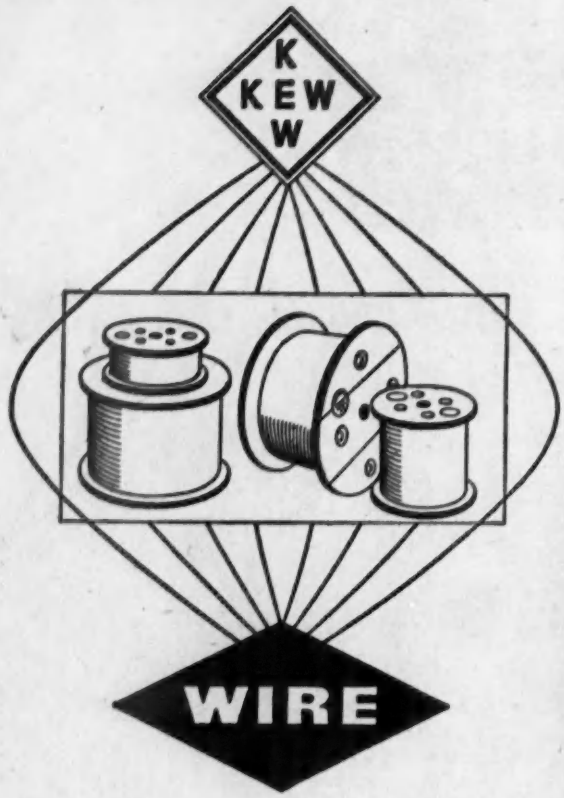

...in a wide range of covering

The opening of our new factory at Bracknell brings a welcome easing of covered wire supplies to all our customers in the electrical industry. Now you may confidently order the covered wire you need from our range of paper, cotton, silk, rayon, etc.

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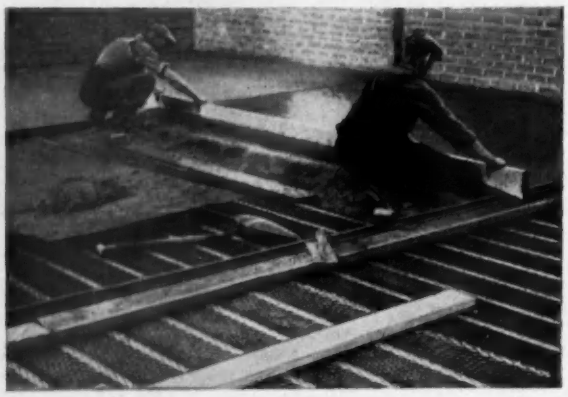
"*Panelec*" CUTS HEATING COSTS

Panelec Embedded Electric Low Temperature Floor Warming guarantees an atmosphere of comfort and warmth in any type of building, irrespective of external conditions—at a cost which is always comparable with, and often less than any available alternative form of heating.



Architects! *Panelec Low Temperature Radiant Warming System reduces building costs. It requires no boiler room, saves fuel storage space and eliminates pipework and radiators — simplifies the job of design too.*

Electrical Contractors! You *can install Panelec quickly and easily in old or new buildings. It is foolproof in operation, thermostatically controlled and needs no attention.*

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Panelec is clean, safe, healthy and automatic—why not investigate its possibilities more fully? Write for Publication No. PAN. 655D or discuss the matter with Panelec Technical Advisory Service. Our Engineers will be pleased to help and advise you.

* *Panelec is designed to take advantage of OFF-PEAK tariffs.*

REGISTERED "*Panelec*" TRADE MARK

N.B. "Panelec" is the original, registered trade name for this patented warming system, which can only be obtained from the address shown here.

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Telephone: REDHILL 3461 (5 lines) PBX. Telegrams: MURELEC, REDHILL.

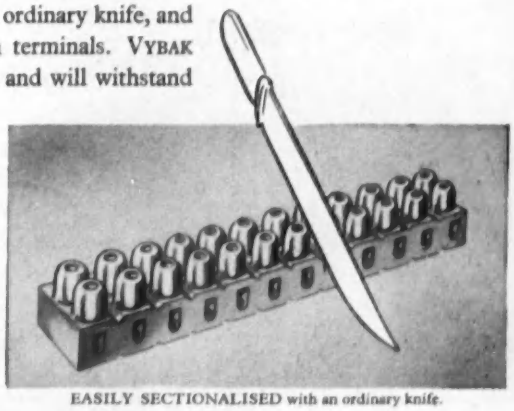
Over the bumps

...round the bends

...along the twists

this Flexible Terminal Block made from VYBAK compounds goes where you want it to go

This flexible terminal strip produced by Belling and Lee Limited was moulded from VYBAK Injection Moulding Compound VX309 — a versatile material made by Bakelite Limited. The resilience of the material not only enables the block to fit curved and irregular surfaces but also to grip the screws so firmly that they cannot be shaken out, even when the block is mounted upside-down. The block can be cut with an ordinary knife, and fixing is easily carried out using the holes between terminals. VYBAK Compound VX309 has excellent electrical properties and will withstand high working voltages even in thin sections. Resistance to mechanical shock and vibration, excellent chemical and fire resistance together with good ageing properties, make VYBAK Compound VX309 a material of immense possibilities in electrical and radio engineering. *You are invited to write for further details.*



EASILY SECTIONALISED with an ordinary knife.

VYBAK REG'D COMPOUNDS

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***Vybak** Products include: **Vybak** rigid and flexible pvc compounds for moulding and extrusion; **Vybak** calendered sheet; **Vybak** flexible pressed sheet —coloured or transparent; **Vybak** heavy grade industrial rigid sheet.*

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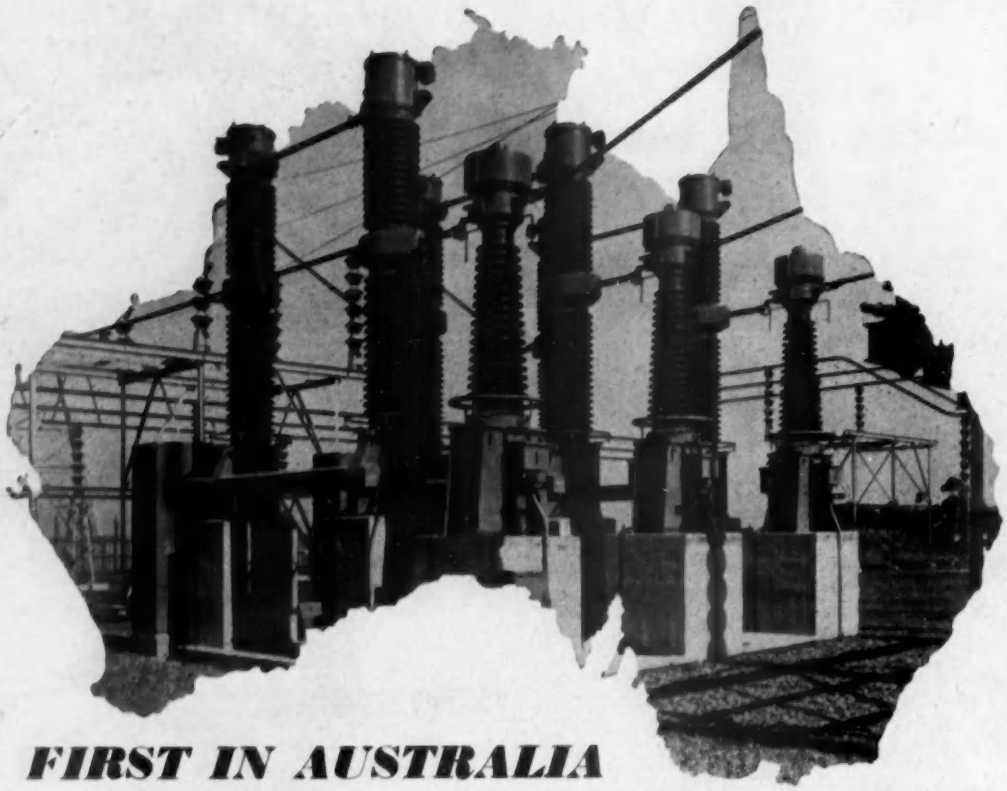

FIRST IN AUSTRALIA

commissioned and energised at 220-kV

The first of a number of 220-kV 5000-MVA small-oil-volume circuit-breakers in normal 220-kV service at the Thomastown Terminal Station of the State Electricity Commission of Victoria controlling the incoming 220-kV line from the KIEWA Hydro-Electric Stations.

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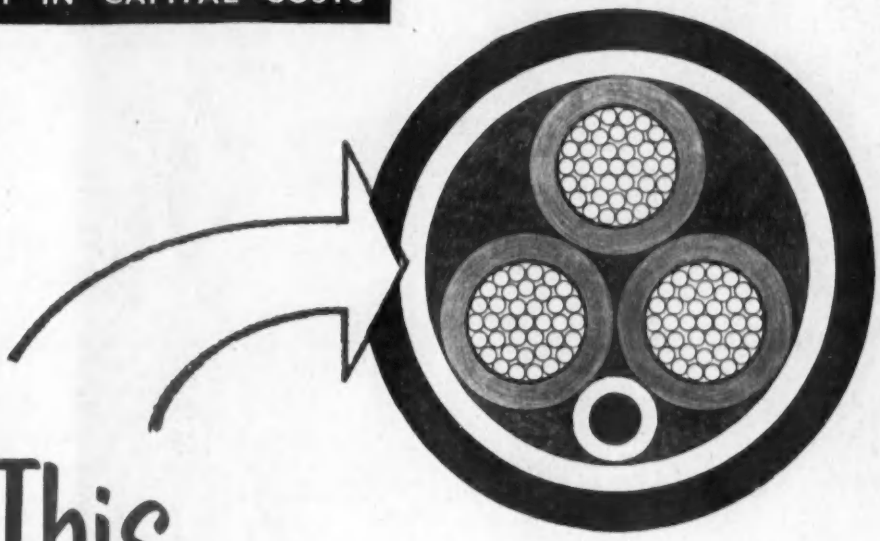

This Aluminium Sheath...

performs the functions of a normal lead sheath PLUS a reinforcement against the internal gas pressure, and a mechanical protection — providing economy in materials and lightness in construction.

SOME TYPICAL INSTALLATIONS

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10,690 yards laid between Perth Road Sub-Station and Buckhurst Hill Sub-Station.

Midlands Electricity Board

9,310 yards laid between Halford Lane Sub-Station and Handsworth and Freeth Street Sub-Station, Birmingham.

South East Scotland Electricity Board

Contract placed for 6,120 yards to be laid between Townhill Power Station and Netherton Sub-Station, Fifeshire.

Brisbane City Council

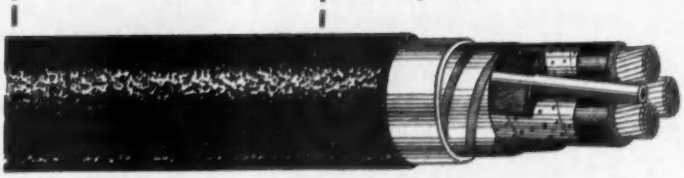
Order in hand for 31 miles to be delivered to Australia.

Aluminium Sheathing is a notable advance in pressure cable manufacture.

Elimination of a separate reinforcement simplifies jointing, while the lighter weight makes the cable more convenient to handle, reducing transport and installation costs to a minimum.

Because of this, BICC 33kV Aluminium Sheathed Impregnated Pressure Cable can offer a saving of up to 25% in initial costs compared with solid types.

Further information is available on request.



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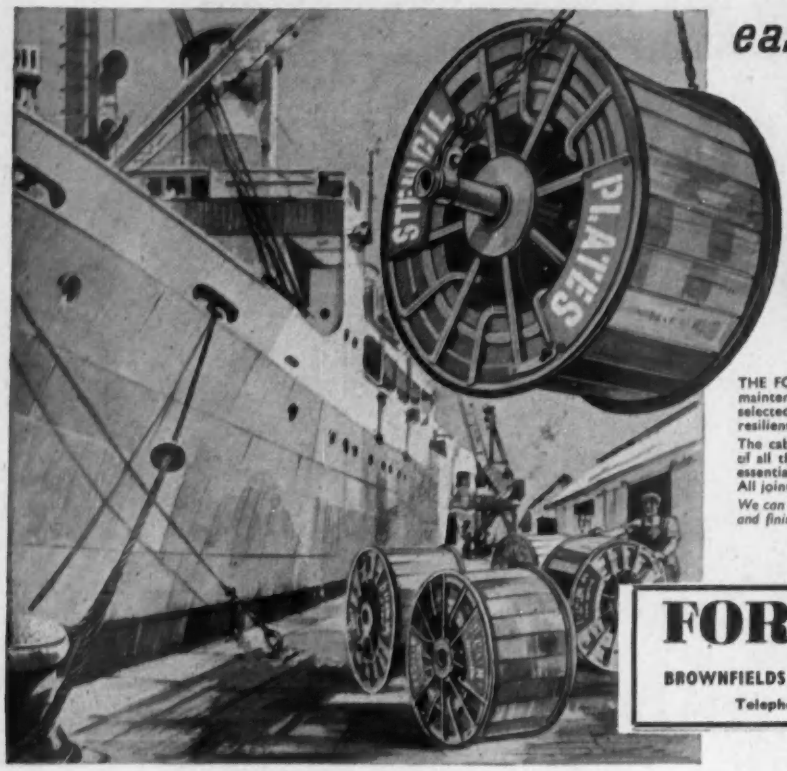

easily transportable

LIGHT · STRONG · LONG LASTING

TUBULAR CABLE DRUMS FOR EXPORT

THE FORGE CRAFT patent tubular steel drum eliminates maintenance expenses. It is made of steel tube specially selected for its relative lightness combined with great resilient strength.

The cable weight is distributed over the whole length of all the spokes and the radial bend gives a flexibility essential for absorbing shocks from all angles of impact. All joints are penetration welded.

We can supply these drums in any size, to carry any weight and finished as required.

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FORGECRAFT
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BROWNFIELDS, WELWYN GARDEN CITY, HERTS
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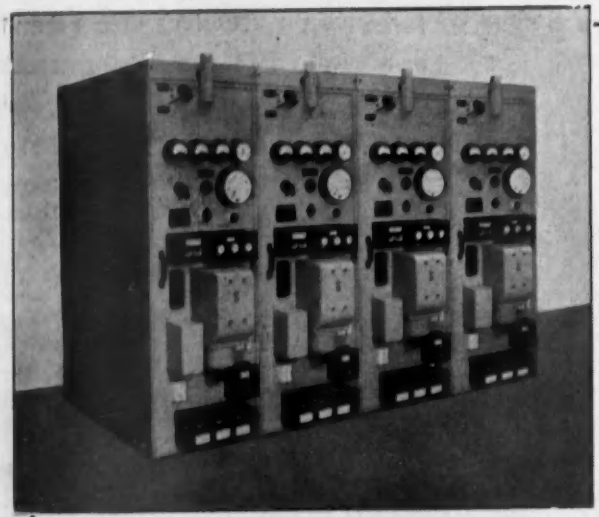
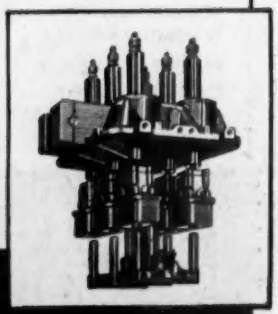


250 MVA
Switchgear
with
TYPE H. 25
oil circuit breakers
6·6 & 11kV.

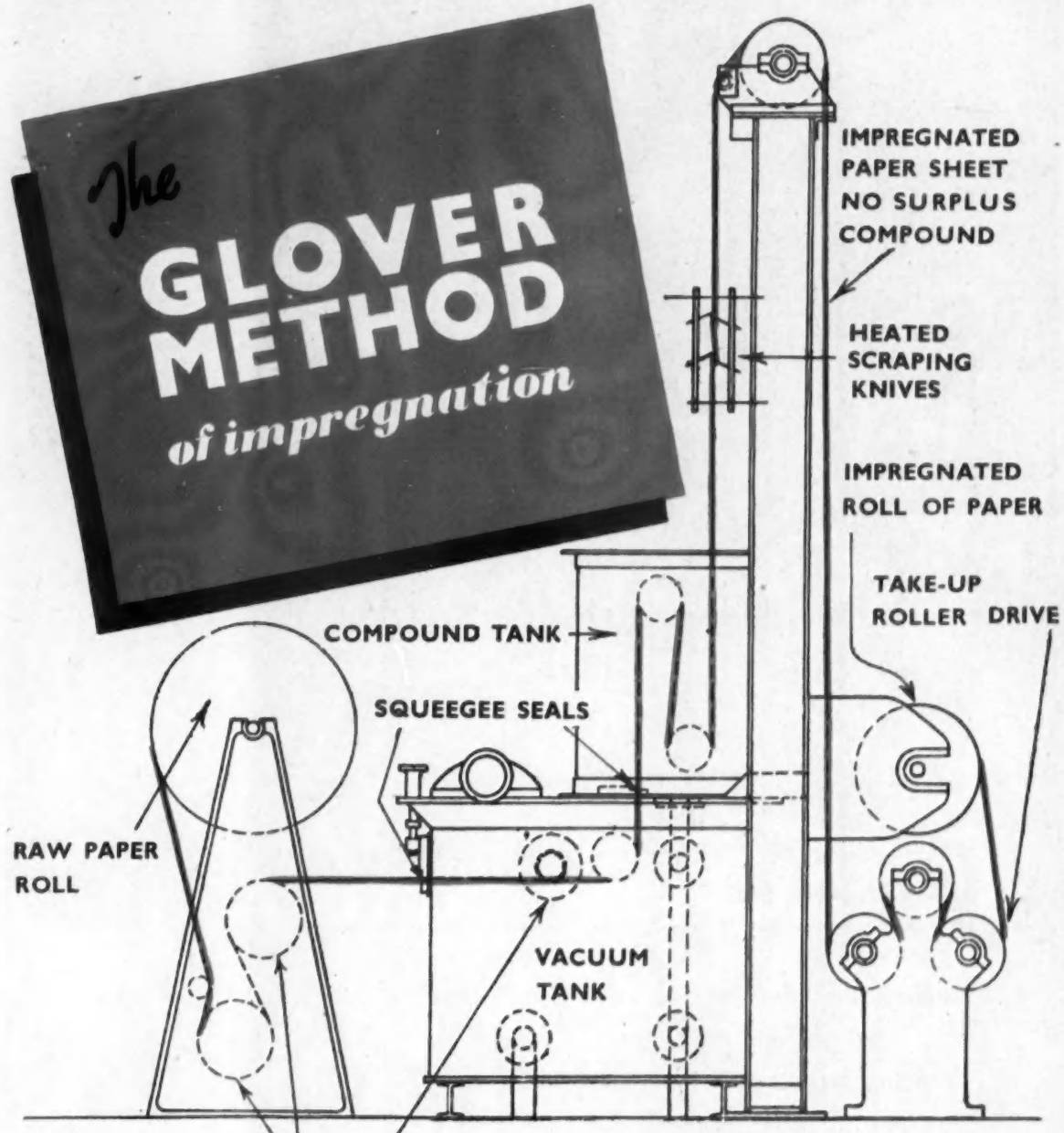


The switchgear is of the air insulated truck or fixed cubicle pattern. The oil circuit-breakers are A.S.T.A. certified and may be arranged for hand, spring or solenoid operation. They can be supplied as loose units for the replacement of obsolete breakers.

THE NEW SWITCHGEAR CONSTRUCTION CO. LTD.
WELLESLEY ROAD SUTTON SURREY TELEPHONE VIGILANT 8234

A2 *Associated with Hackbridge & Hewittic Electric Co., Limited.*

The GLOVER METHOD of impregnation



. . . definitely eliminates compound migration by the process of PRE-IMPREGNATED paper insulated cables

W. T. GLOVER & CO. LTD.

MEMBERS OF THE CMA

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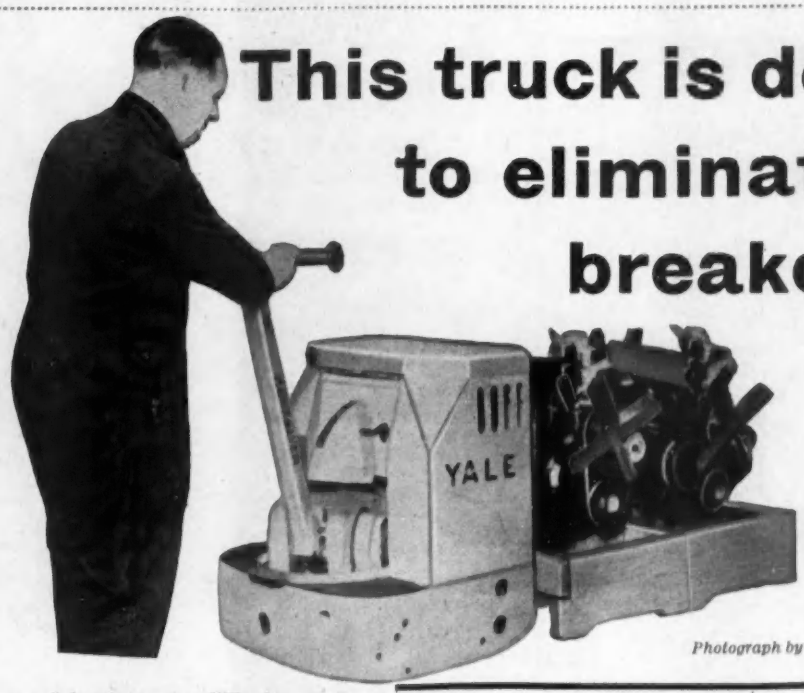
Funny when you come to weigh it up. Here am I keeping *everybody* busy . . . machines running, production humming, the whole works buzzing . . . yet I keep calm and confident as a queen. Cool, quiet, dependable. I may *hurry*— but I never *worry!*

I'm a Busy Little Bee from G.E.C.

G.E.C. Fractionals

THE GENERAL ELECTRIC COMPANY LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

This truck is designed to eliminate breakdowns

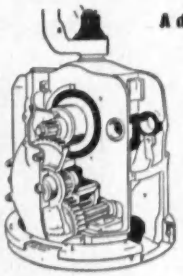


Photograph by courtesy of Humber Ltd., Coventry

A load on your "Worksaver" is a load off your mind!

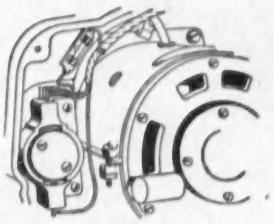
When mechanical handling equipment lies idle—waiting for attention or spares—production costs *shoot* up. Invest in a "Worksaver"; put it to work and compare its trouble-free service with any of your other trucks. Then you'll understand why so many plants—large and small—are changing to Yale.

The "Worksaver" is available in Fork Lift, Pallet, Platform and Tractor models.



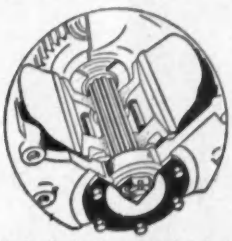
A drive unit that lasts a lifetime

This powerful, robust drive unit will stand up to a lifetime of rough handling. Gears are drop-forged nickel-chrome-molybdenum steel, heat-treated and mounted on ball bearings, operating in oil. Entire drive unit is enclosed and floats on 105 ball bearings.



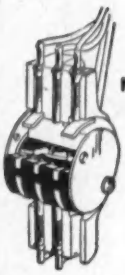
Simple to change brushes

Drive motor of a high torque series wound type, specially designed for easy cleaning and adjustment.



Split hub eliminates pressing in tyres

Worn-out tyres can be quickly replaced by using hand tools—an exclusive Yale feature.



No frayed, broken wires

On the "Worksaver", all flexing, chafing and bending of wires is eliminated. Slip rings are built into the base of the handle so that wiring cannot be twisted or bent, no matter how the handle is turned or lifted.

A capstan built to take the load and more

The load-carrying tapered roller bearing ensures perfect alignment of the unit. The power line is carried through silver contacts. Wires cannot bend whatever the angle of the turn.

Fully protected—easily accessible

The head and heart of the "Worksaver" is fully protected, yet easily accessible for adjustments and inspection. It can be removed from the truck in five minutes.

Finger-Tip control

Large man-size handles with finger-tip cam controls. Ends carry guards for safety. Two speeds forward and two reverse. Lift control and horn button in easy finger-reach position.

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RELIABLE MATERIALS HANDLING EQUIPMENT

Write for full details to

THE YALE & TOWNE MANUFACTURING COMPANY

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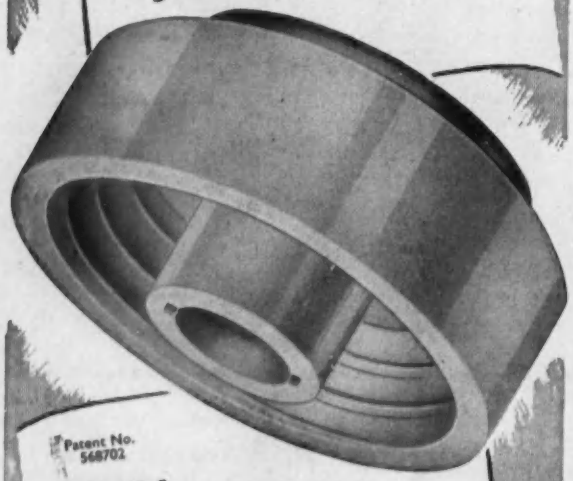
R.E.A.L.

Simplicity



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REAL NON-CORRODIBLE WATERTIGHT FITTINGS

Perfection of design can be very obvious when it has been achieved. The simplicity of R.E.A.L. One-piece Watertight Fittings saves time and cost on erection and re-lamping. Maintenance costs are NIL.

Price List P.5302 gives details of the 60 watt, 100 watt, and 200 watt range of fittings.

The only one-piece screw-neck Watertight Fitting.

Issued by Rawlands Electrical Accessories Ltd. R.E.A.L. Works, BIRMINGHAM 18

ALWAYS SPECIFY STURDY TRANSFORMERS

and be certain of

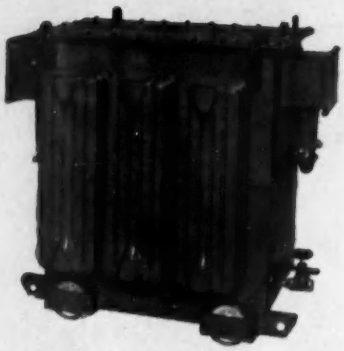
SATISFACTION

Sturdy Transformers are manufactured for all industrial applications from 1 kVA to 100 kVA.

They are being supplied regularly to Government Departments — N.C.B. C.E.A. and many large industrial users.

OUR MANY CUSTOMERS ARE OUR RECOMMENDATION

Our technical service is at your disposal.



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STURDY ELECTRIC COMPANY LIMITED

BURNOPFIELD NEWCASTLE UPON TYNE

Telephone: Burnopfield 237

A complete record *at your finger tips*

MULTI-UNIT TALLY COUNTER

This new Tally Counter will keep accurate records and is far more satisfactory for addition than the 'five bar gate' system. It consists of a number of 4-figure counting units built up in bank form. Any reasonable number of units can be mounted together in banks. Zero reset knob is provided. Write for Leaflet.

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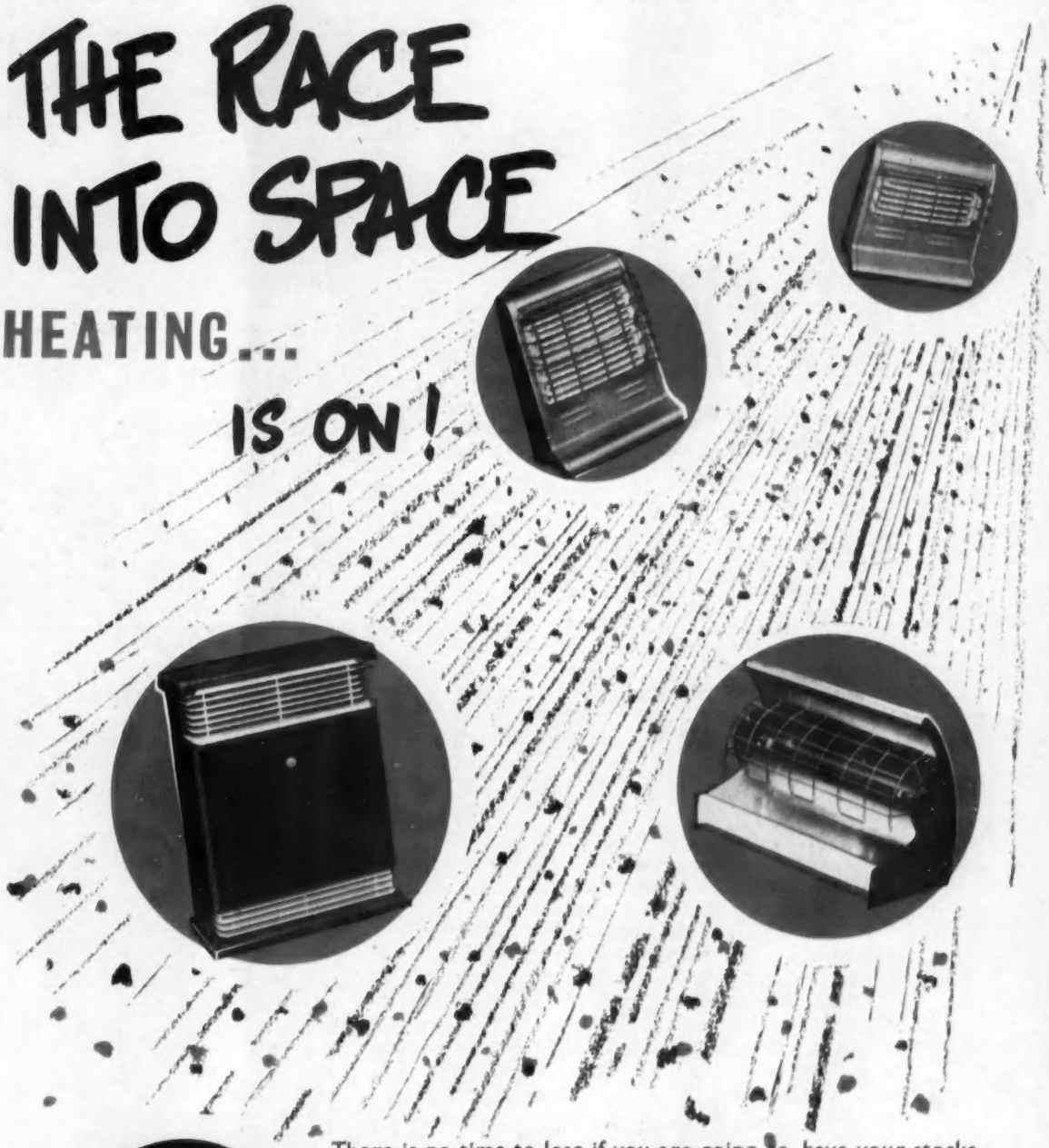
Telephone: ELStree 1382

DON'T WAIT FOR THE GEOPHYSICAL YEAR

THE RACE INTO SPACE

HEATING... IS ON!



There is no time to lose if you are going to have your stocks of B.N.E. heating appliances ready for the Autumn rush. With electric fires maintaining their popularity for short-time heating and the demand for convectors growing every year, you are assured of a ready market—particularly as B.N.E. products combine quality with reasonable prices.
May we send you a copy of our 1955/56 List?

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BRITISH NATIONAL ELECTRICS LIMITED

The Domestic Appliance Section of Johnson & Phillips Ltd.

NEWARTHILL · MOTHERWELL · SCOTLAND

NICKEL-CHROMIUM RESISTANCE ALLOYS OF IMPECCABLE STANDARDS

giving the highest temperatures for the LONGEST WORKING LIFE

'NICHROME' UP TO **950°C**

'NICHROME' V UP TO **1150°C**

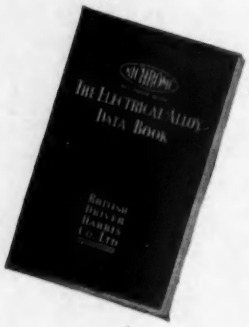
THE NICKEL-CHROMIUM ALLOYS protected by the registered trade-mark "Nichrome" hold a pre-eminent position which is universally accepted.

"Nichrome" V (80/20) is recognised as the most advanced development in alloys for use as resistors at temperatures up to 1150°C.

"Nichrome" (65/15) is the highest standard of quality for resistance wire in appliance heating at temperatures up to 950°C.

The useful life of "Nichrome" alloys is far superior to that of all other alloys when tested at normal operating temperatures.

For full information on the properties and characteristics of these and other alloys, please ask for a copy of THE ELECTRICAL ALLOY DATA BOOK (free on request).



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ASHLEY SELECTIVE ENTRY SPUR JUNCTION BOX

For 13 Amp. ring circuit spur connections, in flat T.R.S. cables up to 7/.044. All insulated, with non-track base. Selective shutters on cover, closing unused entries. Three in-line 30 Amp. terminals, each taking up to two 7/.044 conductors. 2" fixing centres. Complies B.S. 816. Pat. No. 702,553.

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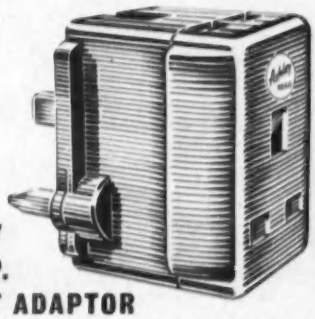

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For B.S. 1363 socket-outlets and plugs. All insulated. Twin shuttered outlets. Total loading controlled by B.S. 1362 13 Amp. cartridge fuse-link. Individually cartoned display pack of six.

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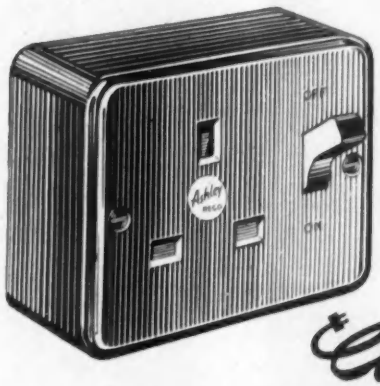

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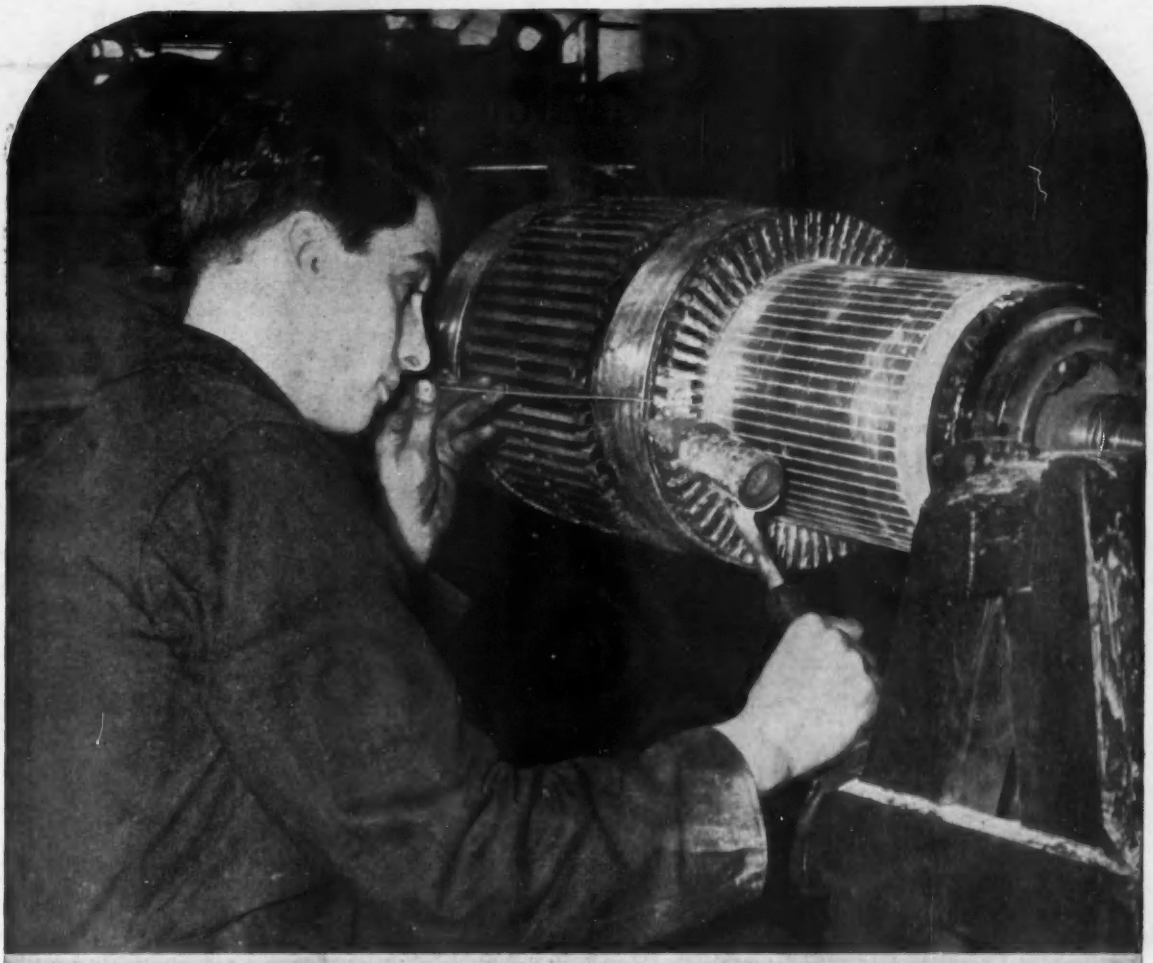

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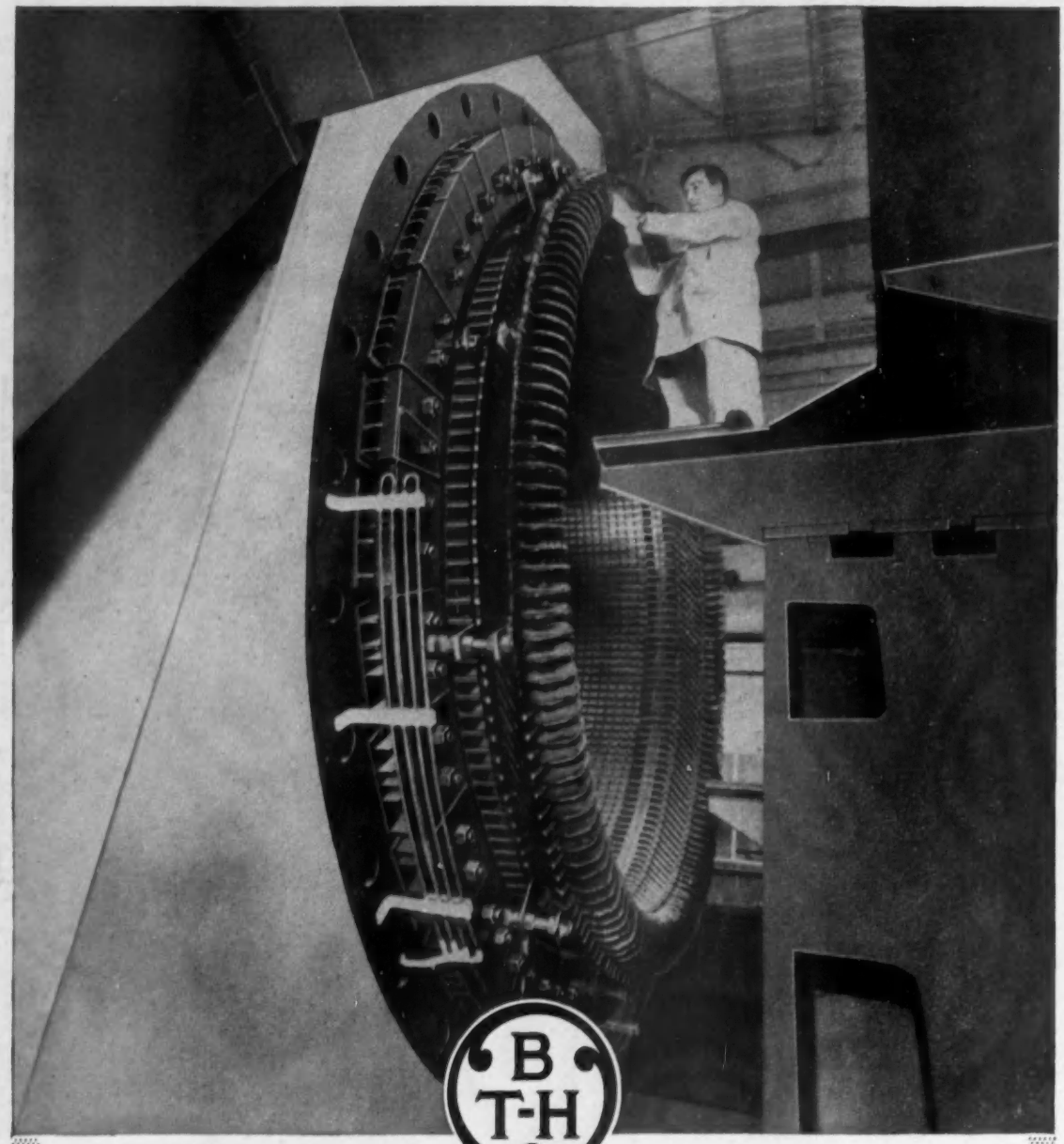

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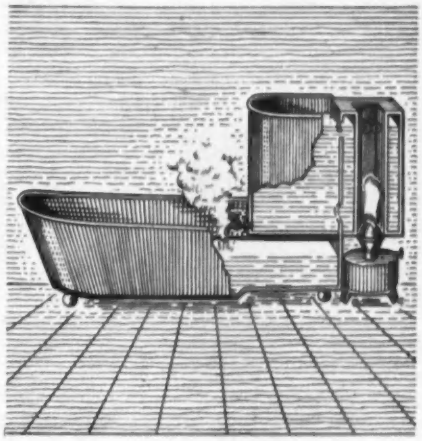

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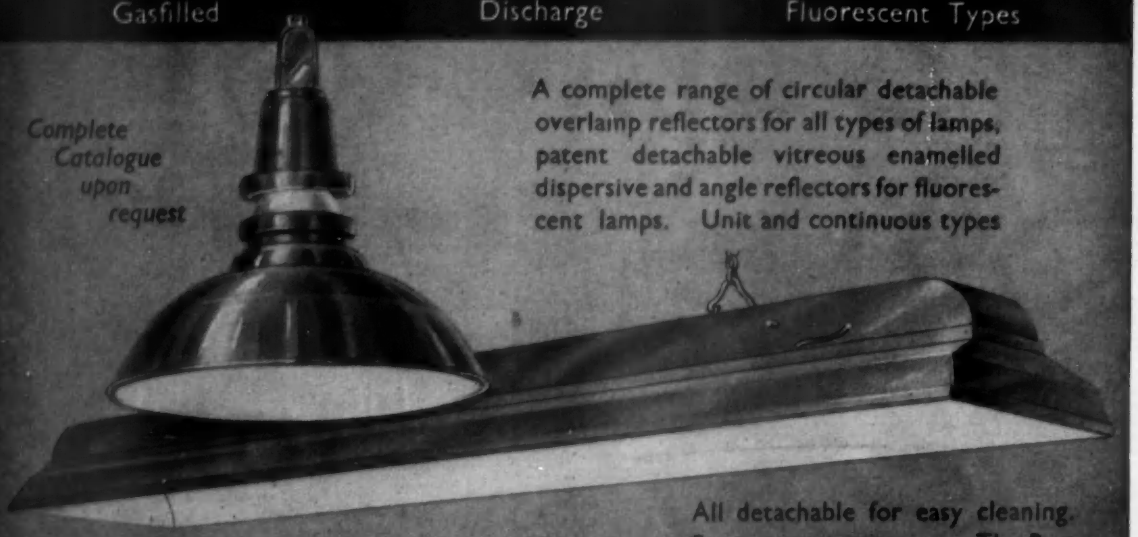

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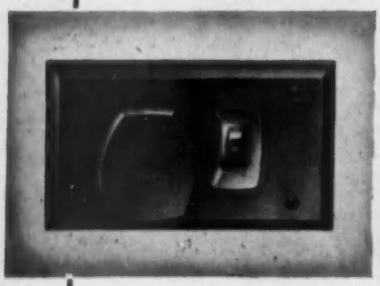

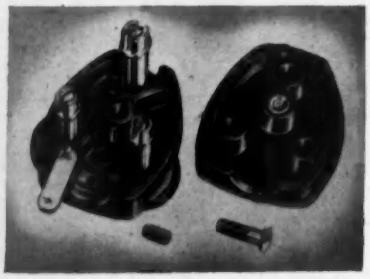

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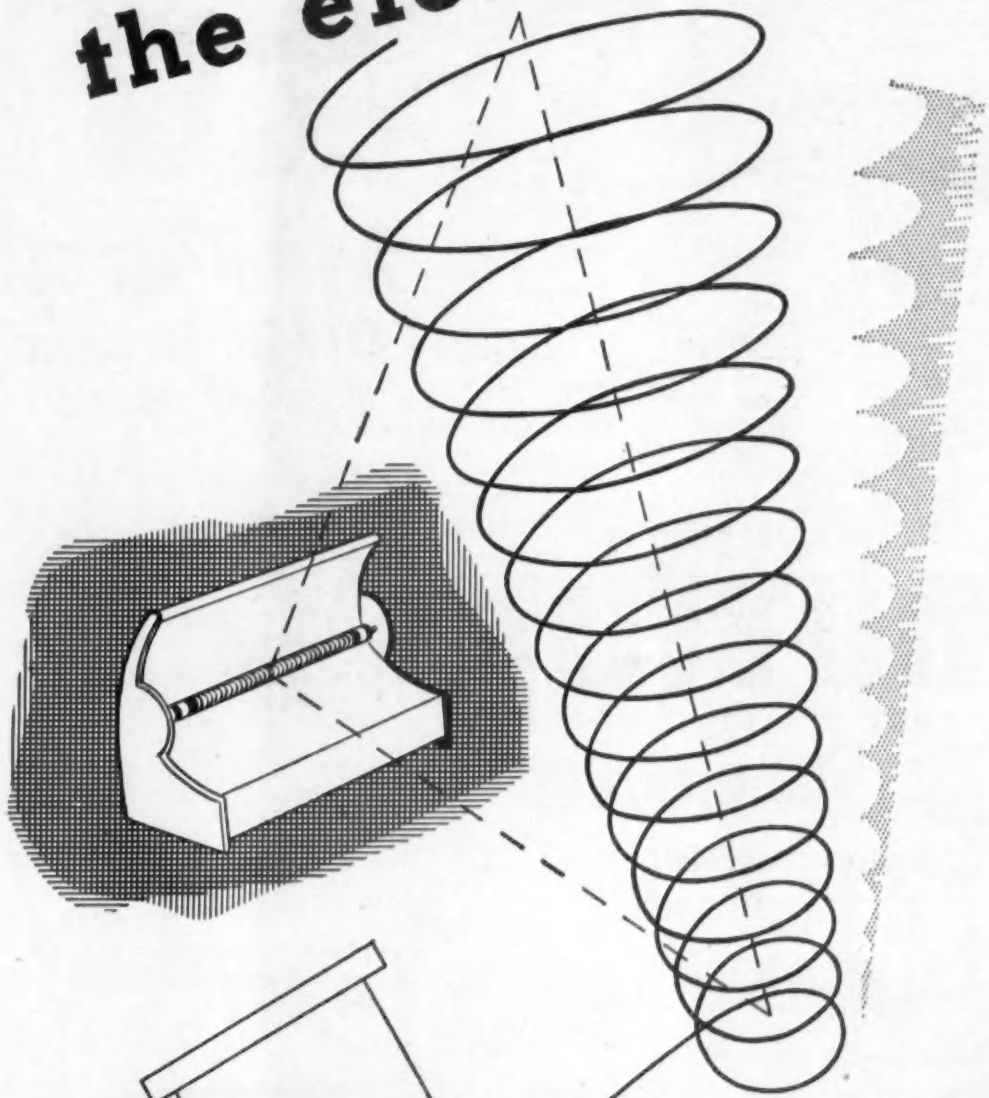

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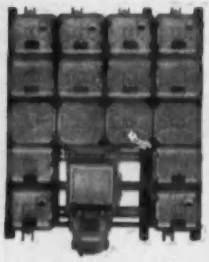

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PRICES EFFECTIVE FROM AUGUST 24th, 1955

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All are fitted with special guards to B.S. specification and conform to latest safety requirements.

Guards and reflectors where applicable, are chromium plated.

When ordering please state catalogue number, colour and voltage required.

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Pastel Finishes—GREY, GREEN, BEIGE with 'Solaray' (pencil type) or 'Challenge' (block type) fire bars.

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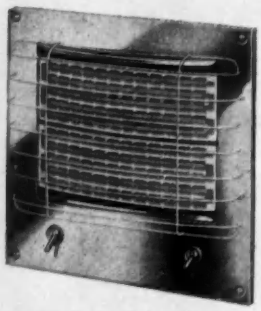

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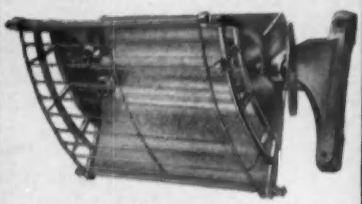
Complete with 6ft. of flexible cable.



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This wall mounting fire is ideal for bathrooms, nurseries, etc. where it can be placed out of reach, the adjustable reflector and switch being provided with an attachment for a hanging cord.

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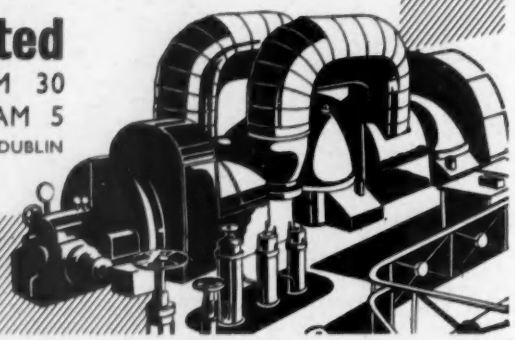

M-W.106

AUTOMATIC CONTROL GEAR

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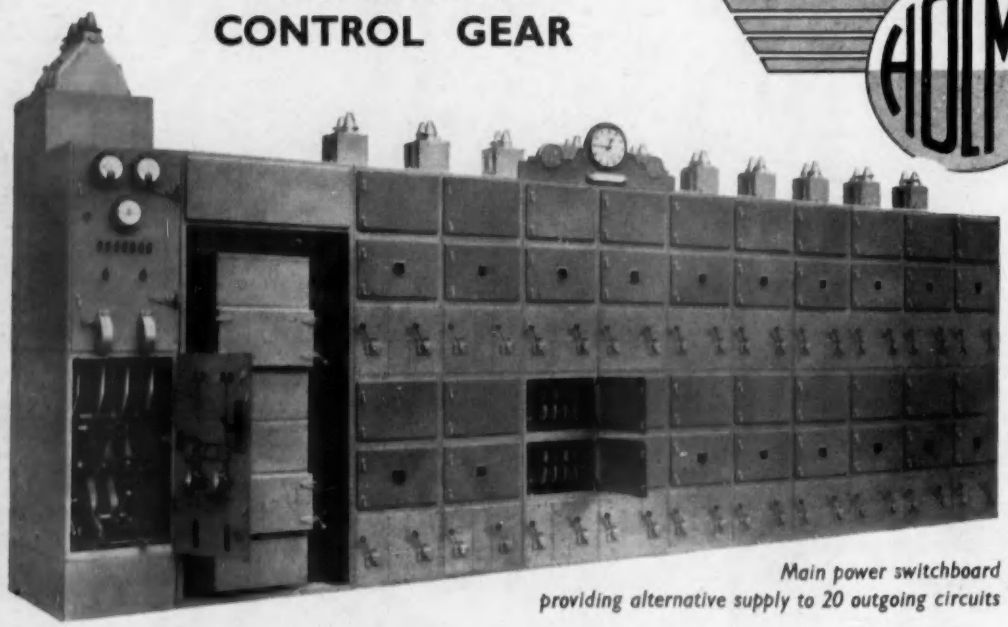

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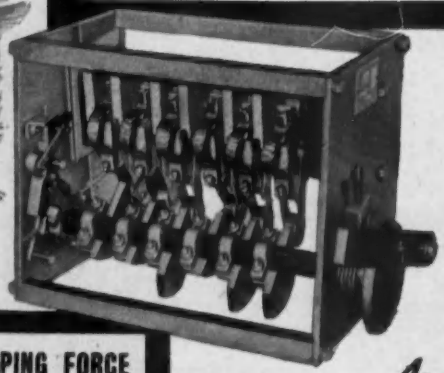

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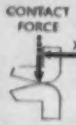

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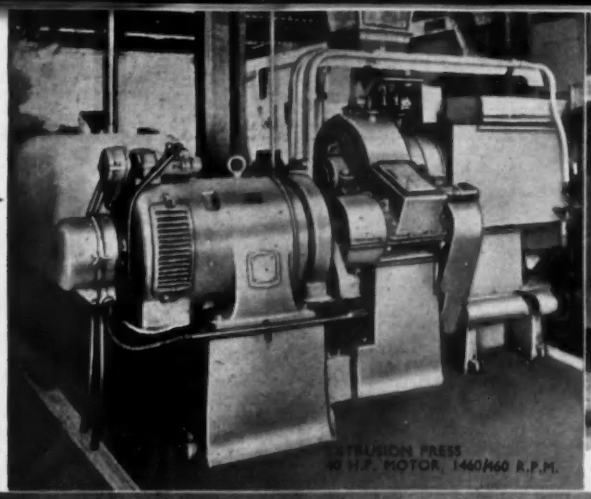

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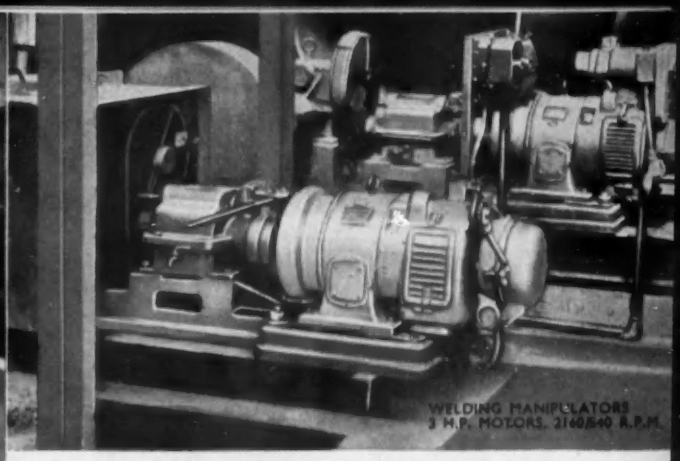
40 H.P. MOTOR 1460/660 R.P.M.



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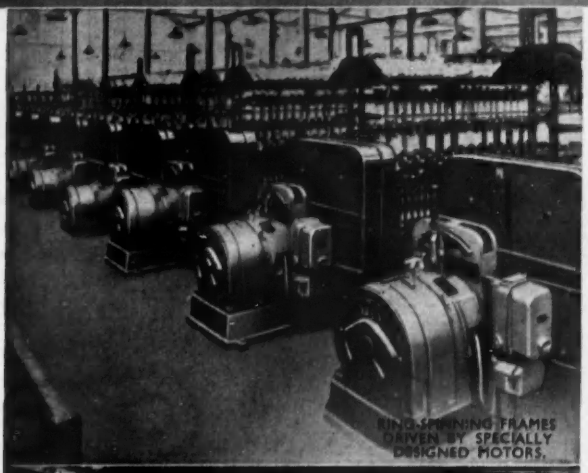

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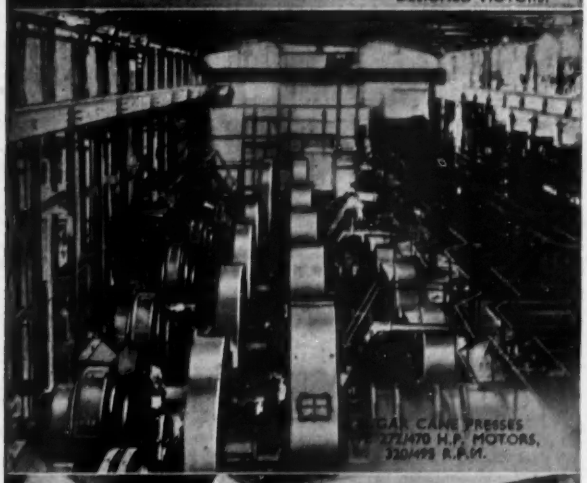

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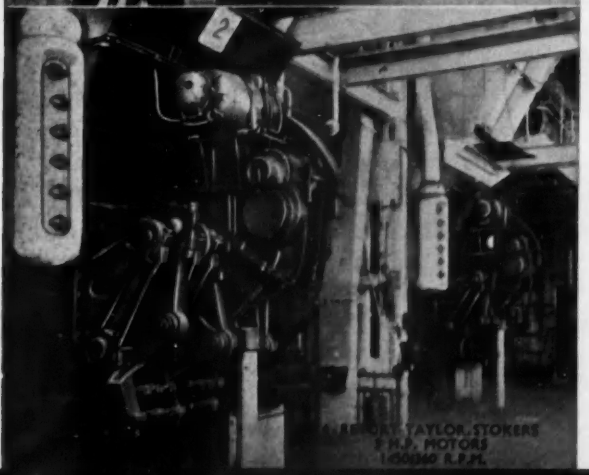

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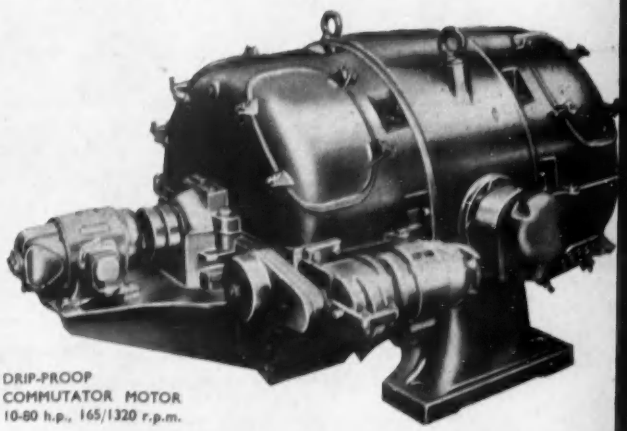

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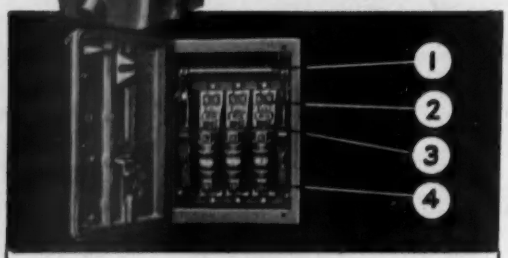

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JUDGEMENT ON GENEVA

The resounding success of the Geneva Conference on Atomic Energy has now become scientific history. In all its sections, the Conference achieved a standard of exchange of detailed information which more than realised the hopes of the organisers; certainly, it never lapsed into the generalities and platitudes that many had feared. As a result, progress in engineering has been taken forward a decisive step. Basic technology is now available freely to all, which without the influence of the Conference might have languished for years awaiting some busy high executive's formal assent for publication. Now that this backlog has been cleared, the whole problem of future release of information obviously should undergo re-examination to minimise unnecessary security delays in the future. Further, new personal associations have been established at the Conference, and informal discussions between technologists of different countries working on similar problems have taken place, which have not been possible for nearly twenty years. This must benefit nuclear science and engineering almost as much as published information. These gains are international, but it is natural here to pay particular attention to the British contributions to the Conference. In the main, these were successful and impressive. But in the all-important subject of nuclear reactor for power stations, a reservation must be made. Here understatement was the common characteristic of British papers, and it contrasted to its detriment with the showmanship of the Americans. The cautious approach to possibilities and the accent on conventional engineering problems rather than those of nuclear technology, which were the feature of the two British power reactor papers, may have been desirable as a warning against over-enthusiasm. But they did not match the spirit of the conference, nor did they give an adequate idea of the range of work Britain is carrying out in the power reactor field. It is too late to correct this understatement within the framework of Geneva but it is important that better arrangements should be made in the future to give full value to the British effort, rather than to state its minimum possibilities. Especially is this important for our prospects in the export field, which the U.K. Atomic Energy Authority seems inclined to play down at present. The answer may lie in more being heard from the nuclear engineering commercial groups which are already playing an important part in Britain's nuclear power programme, and which should have achievements independent of A.E.A. to boast of when the C.E.A. nuclear power station construction gets under way.

BATTLE OF THE SYSTEMS

Nuclear power generation is entering the realm of practical engineering with a great embarrassment of possible systems. At least two nuclear fuels are possible, and if to these are added major choices for all the other main characteristics of the nuclear reactor, one speaker estimates that the combinations give one hundred reactor "species" which are not obviously physically impracticable or uneconomic. Enthusiasts for each of the designs so far put forward are as tireless as the early electricity a.c. versus d.c. controversialists in presenting the case for their own fancy, though perhaps more cautious in claims on account of the great lack of experimental results to support paper arguments. It is this lack of complete engineering evidence that stands out in the welter of designs described in Geneva. Many components have been tested; few power reactors put together. The largest nuclear power plant known to be producing electricity regularly at present is the Russian 5 MW station, and that is admitted to be seriously inefficient, partly, at least, because size is even more important for nuclear power station efficiency than for conventional fuel-fired stations. Calder Hall when it becomes operative next year will extend tenfold the energy range of experience, but it is already known to be capable of great improvement in performance without major modification in its design. An immense and complicated development programme following many parallel paths obviously lies before reactor engineers in the next 20–40 years. The magnitude of the work and wealth that will go into this development emphasises again the importance of the opening of international channels of communication on reactor topics which Geneva has signalled. During the coming years the minimum overlapping possible between those working on reactor development is desirable from a world viewpoint. This is the more important since expert opinion tends to the view that no uniquely best reactor will emerge. Rather it is thought that many choices will exist, marginally preferable at any given time and place.

RADIO AND TELEVISION OUTLOOK

At least three factors have combined to make 1955 a milestone in the history of radio and television. These are the introduction of VHF/FM broadcasting, the coming into existence shortly of the ITA programmes on Band III and the growing attraction of high fidelity reproduction. It is therefore particularly unfortunate that this year's Radio Show should have been bedevilled by labour troubles, which have resulted in late opening of the Exhibition. From the information provided by manufacturers, however, two points of major significance have arisen. One is that even with the steady increase in cost of materials and labour most firms have succeeded in holding down to a reasonable level the price of radio receivers capable of accepting VHF/FM. This has in many cases only been carried out by the almost wholesale elimination of sets restricted to amplitude modulation only. There can be little doubt therefore, that the industry is fully realising the growing demand for "quality" sound in the congested wavebands of today. Second is the increasing demand for the larger television tubes. Over the past six years the size has been steadily increasing, and from the 9 and 14 in. tubes of only three years ago, sizes of 17 and 21 in. are now becoming standard. It seems, however, that more advantage might well have been taken of introducing a VHF/FM receiver within television sets.

COPPER IN THE NEWS

Copper is hitting the headlines with almost film-star frequency and last week saw another new milestone passed on the way to £400 copper, when bids carried the price to over £375 a ton. The inability of supply to keep pace with world demand has been a continuing feature of copper since the end of the war, and the present high prices have been reached despite the deferring of U.S. stockpile deliveries. Labour troubles have contributed to the marginal shortage which is responsible for the present bull market but these are no new factor and it is becoming clear that production is not expanding at an adequate rate. We are promised better prospects for next year. Unfortunately, however, past experience suggests that we should not set too much store by this. Meanwhile, the price mechanism continues complex. In addition to the London market rate there is the lower Rhodesian Trust price which favours the large buyer and the world picture shows the queer twists associated with goods in short supply. In the meantime, the London Metal Exchange have been specially considering the position with regard to electrolytic wire bars which are in greatest demand and a new contract has been proposed, tied specifically to this grade. Unfortunately, the new contract must await an adequate volume of wire bars reaching the market before it can be operated satisfactorily and the prospect of this is uncertain.

DEVELOPMENT IN KUWAIT

In large central power stations the evaporator is a subordinate of the boiler house system. In Kuwait, however, as is shown in our leading article this week, the power house has become almost subordinated to the evaporator plant, for here has been established the world's largest salt water distillery. This plant provides potable water—a commodity which has hitherto been imported—and electric power from a comprehensively integrated production unit. The primary fuel for this project is natural gas, previously burnt to waste. The climate of Eastern Arabia is most suitable to outdoor construction and in consequence this form has been adopted for the majority of the distillation plant and all the boilers. From the electrical viewpoint, the establishment *ab initio* of an isolated power station group with an ultimate capacity of over 70 MW together with its associated distribution system has provided a remarkable opportunity for the consultants to plan a comprehensive scheme. Even so, demand is rising exceptionally fast, from 500 kW in January, 1952, to over 13 MW in 1955, and further enlargement of distribution is contemplated. Fortunately, Kuwait is one place where capital should be available in adequate quantity, not only for electrical purposes but for the extensive general development plans being undertaken by the present Sheik Sir Abdullah al Salim al Subah.

Meteor

Electrical Development in KUWAIT

Part One describes the extensive distillation and generating facilities being completed

By R. A. NORRY,* B.Sc., A.M.I.E.E.

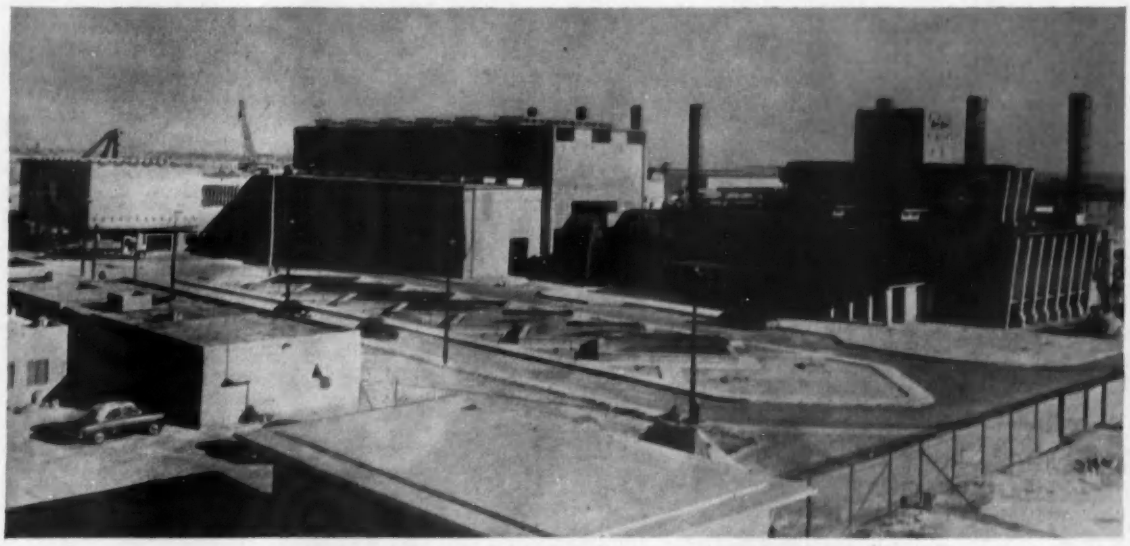
SITUATED on the arid shores of Eastern Arabia, low-lying and sandy, isolated by deserts, the independent Sheikhdom of Kuwait is severely handicapped by its climate and lack of fresh water. A rainfall of 3-4 in. per annum is about average, and, ironically, this small amount of rain usually contrives to do a great deal of harm by falling all within the space of a few days, thereby causing floods and in some instances damaging the less substantially built houses. This low rainfall, combined with an absence of rivers, has meant that except for the produce of a few small but intensively cultivated farms at the nearby oasis of Jahara, twenty miles to the west, almost all food and even drinking water had, in the past, to be imported. Drinking water was brought almost 100 miles by dhow and, more recently, by tanker from the Shatt-al-Arab. Food was, and still is, at the moment, obtained from the fertile regions of the Tigris and Euphrates basin, and the Kuwaiti existed largely by his ability to construct ocean going dhows capable of roving as far afield as India and Madagascar, coupled with a natural aptitude for shrewd trading. Summer shade temperatures of 120° F, with long periods of high humidity and occasional searing sand storms complete the picture.

Soon after the last war the ruler at that time, Sheikh Sir Ahmed al Jabir al Subah, undertook a long term development policy for the benefit of his 200,000 subjects. This policy has been vigorously pursued by his successor Sheikh Sir Abdullah al Salim al Subah, K.C.M.G., C.I.E., and includes what must surely be the finest hospitals, schools and clinics in the Middle East, together with housing projects and vastly improved amenities—all the facilities of a modern city. With the aid of specialist advisers, the Kuwait Government commenced the task of replanning the town on modern lines, but it was obvious to the ruler that amongst the first needs of his people were ample fresh water and electricity for domestic air conditioning and refrigeration. Accordingly, he commissioned his engineering consultants to design and construct a plant to provide one million gallons of drinking water per day by distilling sea-water, to be followed by a steam power station having an installed capacity of 30 MW. The site of operations was to be Shuwaikh, an area scheduled for industrial development some two miles west of the town and adjacent to the new port area. Site work on the distillation plant which is the largest in the world and now known as "Distillation Plant A" to distinguish it from its successors, was commenced in October 1951, and despite the difficulties of heat, sand and long shipping periods, the plant went into commercial service in April 1953.

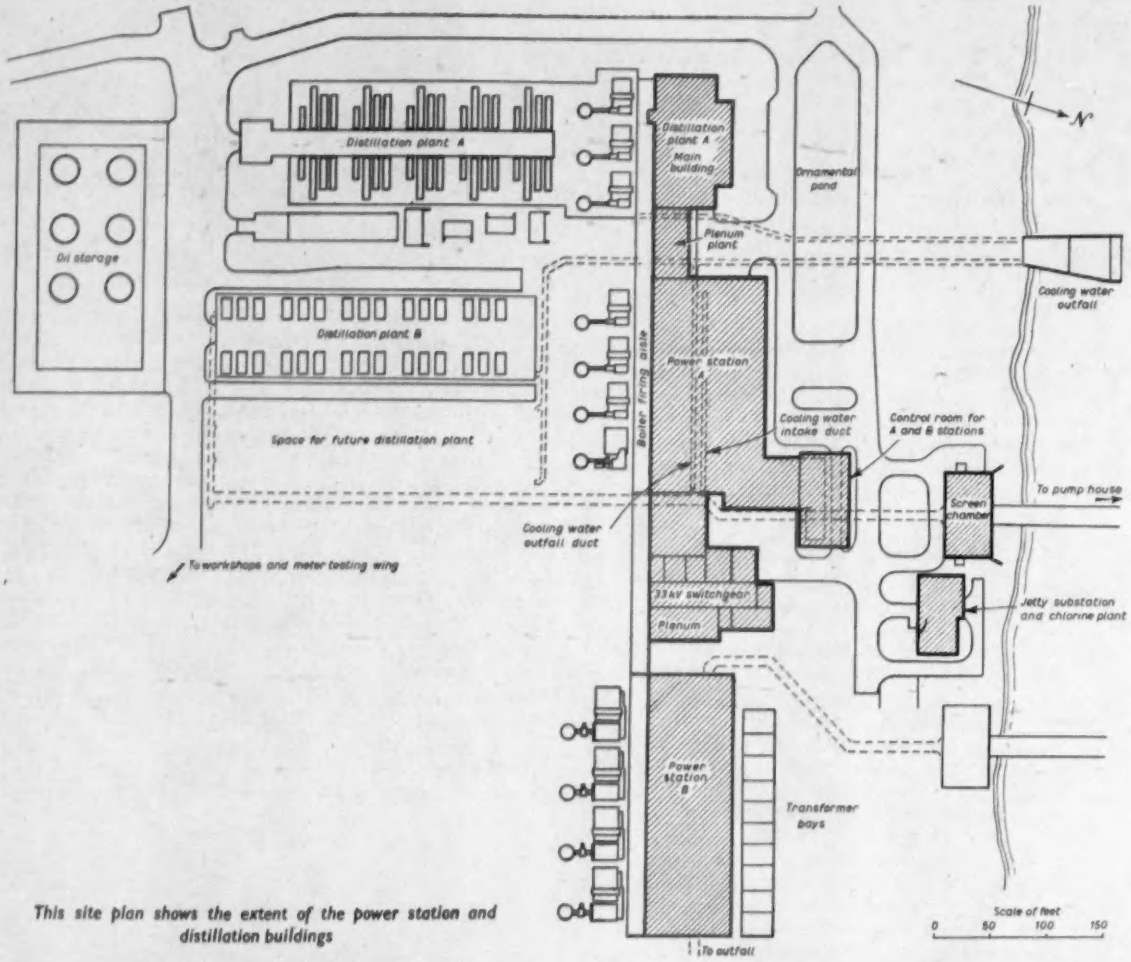
*Mr Norry is with Ewbank and Partners, Consulting Engineers.

"Distillation Plant A"

The distillation plant comprises three integral furnace bi-drum boilers, each of 80,000 lb/hr capacity at 210 p.s.i.g. and 720° F. The boilers are fired by natural gas brought thirty miles over the desert in 8 in. diameter steel mains from the neighbouring oil fields of Magwa and Burgan. The gas, approximately 75% methane, 12% ethane and 5% propane, has a calorific value ranging from 1,100 to 1,200 B.Th.U. per cubic foot at 60 p.s.i.g. and 60° F, and was previously flared off to waste. It is supplied at a pressure of 400-500 p.s.i.g. but is reduced after scrubbing to 10 p.s.i.g. for firing. The boilers are arranged for automatic change-over to oil firing if required in the event



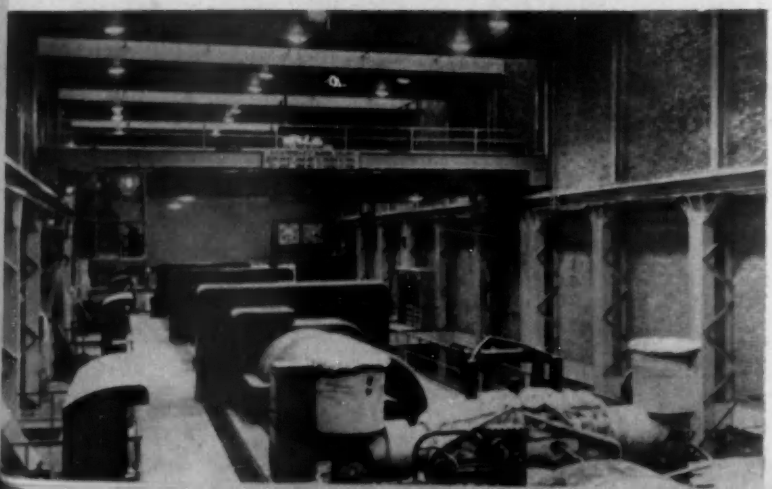
The Station forecourt with Power Station "A" on the left and Distillation Plant "A" on right



This site plan shows the extent of the power station and distillation buildings

of an emergency shut down of the gas supply, and tank storage of 360,000 gallons of bunker oil is provided. There is no gas storage, except the effect of the long pipeline. The boilers are mounted entirely in the open air, a simple covering being built over the firing aisle as a sunshade. The evaporators themselves are also an outdoor installation with similar protection for the operators. Constant speed ring-lubricated motors are provided for both the i.d. and f.d. fans, with water cooled bearings. Feed pumps are mounted inside the main building and are electrically driven with the exception of one steam stand-by unit. The feed is controlled by Copes regulators and intermittent chemical dosing is employed to keep the boilers scale-free.

Turbine room of the power station "A" looking west. No. 4 machine is in process of being lagged



Before being used for distillation purposes, steam from the boilers is passed through three 875 kVA, 440 V, 3-phase back-pressure gear-driven turbo-alternators to provide power for the various auxiliary drives. A 625 kVA diesel driven alternator provides power for starting up. Any surplus power is stepped up to 11 kV and exported to the distribution system.

Leaving the pass-out turbines, the steam enters the distillation plant proper at a pressure of 5 p.s.i.g. The plant comprises 10 triple effect evaporator units. On leaving the first effect, the steam is returned to the boilers as condensate, and vapour from the first effect used as a heating medium for the second effect. In turn, heat required for evaporation in the third effect is provided by vapour from the second effect. The incoming sea-water which is to be distilled is first pre-heated by the use as cooling water in the condensers of the evaporating plant and the final product pumped into storage reservoirs totalling 24 million gallons capacity. Before it is forwarded to storage, however, a small percentage of brackish water brought from wells at Sulabiyah, 10 miles to the west, is mixed with the distillate to provide the salts necessary for good health and render it palatable. In view of the corrosive nature of sea water, copper-bearing steel was used for the evaporator shells, the internals being given a sprayed coating of aluminium, 5/1000 of an in. thick. This, in association with magne-

Control room and 11 kV switchgear at power station "A"

sium anodes in the end boxes, has proved quite successful in resisting attack. A chlorination plant is provided to combat marine growth which is particularly active in the naturally warm waters of these coasts, a cycle of 5 days on, 4 days off, being found most suitable. However, in view of shipping costs, chlorine is an expensive item in Kuwait and consideration is being given to the possibility of manufacturing a chlorine liquor of suitable concentration by electrolysis of sea water, employing permeable membrane cells to effect separation. If this is found satisfactory, the liquor will be injected direct into the coolant intake, thereby avoiding storage of any quantity of a potentially dangerous material.

Power Station 'A'

Site work on the Power Station commenced in February 1953 and it was decided to include a second one-million-gallon distillation plant, "Distillation Plant B." With this in mind, a further four 80,000 lb/hr boilers were provided, feeding into a common steam main with the boilers of the original distillation plant, the firing aisle being a direct continuation.

Ease of operation and maintenance were prime factors affecting the choice of plant. The sets in the generating station comprise 4—7·5 MW single cylinder pass-out turbines running at 3,000 r.p.m. and coupled to alternators generating at 11 kV, which is also the switching voltage. The machines are self-ventilated and provided with 51 kW shaft-driven self-excited exciters. Air coolers with cast iron water chambers and Yorcoron copper tubes use sea-water at 90° F. Two 750 kVA, 11 kV/415 V ON. transformers each feed a contactor board, each board in turn controlling the auxiliary supplies for two boilers. These transformers are de-rated from 1,000 kVA (U.K. rating) in view of the Kuwait high ambient temperature. A further two similar transformers feed a station 415 V board which provides a stand-by supply to the boiler boards, an automatic changeover feature being incorporated, and also feed the two alternator contactor boards. The use of gas as a fuel and the simplicity of the machines has led to a very simple auxiliary system, there being no complications of fuel and ash handling beyond the provision of emergency gas—oil fuel changeover valves, scrubbers and pressure reducing equipment.

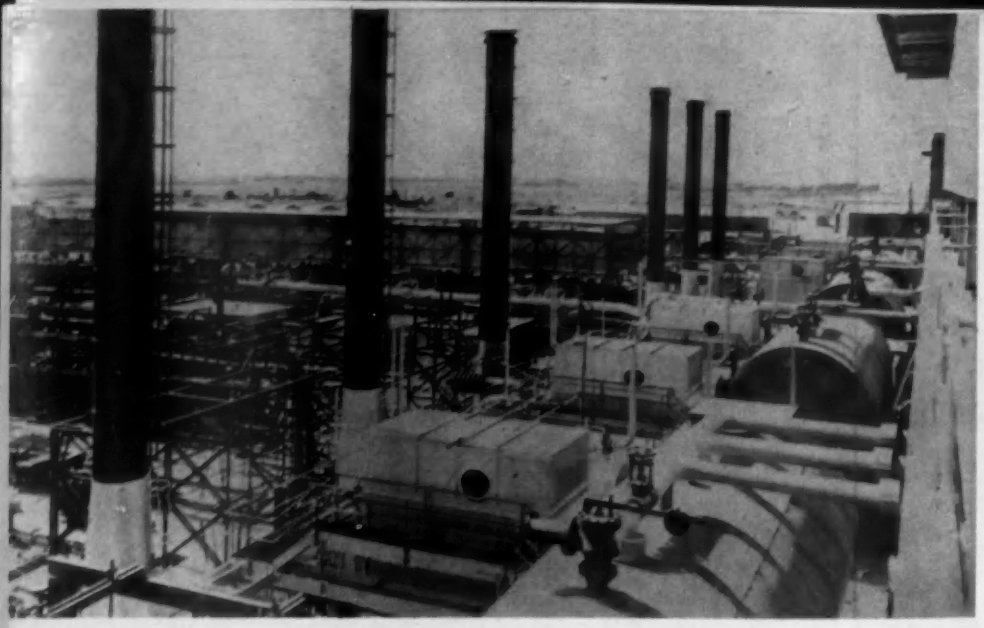
Cooling water is obtained from the sea by means of an intake jetty four hundred feet long constructed on steel piles and carrying four thirty-inch diameter cast iron pipes. The seaward end carries a pump house containing four vertical 135 h.p. pumps each delivering 1 million gallons per hour. The pump motors are supplied at 415 V, the contactor equipment and stepdown transformers being accommodated in a substation at the landward end to minimise the risk of troubles due to sea-water and spray. Rotary disc screens fitted with washers are also accommodated at the landward end. The water is taken around the station in concrete culverts, intake and discharge culverts running on either side of the axis of the machines. The jetty is protected against sea-water corrosion by means of a distributed anode bed of graphite rods laid on the sea bed between the piles and energised by an oil-immersed transformer rectifier maintaining a potential sufficient to prevent electrolytic action.

The 415 V cubicle pattern station board employs solenoid-closed air-break switchgear rated at 25 MVA. The boiler and alternator contactor panels are of orthodox design and employ air-break circuit-breakers for the incoming circuits. All the 415 V switchboards are located on the turbine operating floor, together with the station common services board which is of the combined switch-fuse pattern. All except the latter are controlled from the control room with alternative manual control at the board itself. Auto-trip lamps on the individual panels give indication to the turbine room operators of an electrical fault affecting the auxiliaries, in conjunction with an alarm facia located in the turbine room, which shows which switchboard has been affected.

The main switchboard is of the horizontal-drawout-isolation, solenoid-operated, metalclad gear type, having duplicate compound-filled busbars and rated at 500 MVA, this comparatively high value being necessitated by the decision, taken in 1953, that a second generating station would certainly be required in due course. Off-load plug change bus selection is employed, a bus-coupler and bus-section circuit-breaker being provided, the latter being accommodated between fire-proof walls fitted with self-closing doors. A "hospital" bay is available for circuit-breaker maintenance. Fire protection is afforded by a fixed CO_2 installation initiated by fusible quartz bulbs rupturing at 175° F.

Control Room

The control room has been designed to accommodate the 415 V auxiliary switchgear controls in the form of a miniature mosaic diagram type of control board operating by direct wire control at 50 V d.c., with conventional cubicle type control boards for the 11 kV feeder circuits, together with an alternator desk accommodating the machine controls. In addition to this, a 20 ft long mosaic diagram indicating the 11 kV distribution system is provided, together with a log desk into which have been brought telephone connections from the machines, the distribution substations and the town telephone exchange. Radio communication is provided to outlying substations where telephone lines are not available, and to mobile breakdown vans. This system is so interconnected that a repair gang can get into direct contact with a subscriber on the town telephone system, or with any substation.



On the left, a view over the outdoor boilers looking towards the distillation plant "A", with the distillation plant "B" in the course of construction on the left of the photo

On the right-hand page is a view of the evaporator raft of distillation plant "A" looking north

Space has been left in the control room for control equipment for the main and auxiliary switchgear and machines of the future "B" station, work on which will shortly begin.

The control room is fully air conditioned, chilled water being produced in a 100 ton refrigeration plant housed in the power station building and comprising two 75 h.p. reciprocating compressors and associated equipment. The chilled water is supplied to an air conditioning plant room located below the control room which accommodates the ventilating equipment and air heaters. A similar air conditioning plant room is provided for the office accommodation. This plant is capable of keeping the temperature down to 80° F and 50% humidity. With a view to providing a cool and tranquil atmosphere in the control room, the control panels were finished smoke grey and all instrument bezels a lighter shade of grey. French windows open out of the north side of the control room on to a small verandah overlooking the cooling water intake jetty and the sea.

Rhodium plated control switch handles were supplied to present a pleasant appearance and to avoid perspiration troubles, and fluorescent lighting employed to avoid the additional burden which would have been thrown on the air conditioning plant had tungsten filament lighting been used. An intensity of illumination of 20 lum/sq ft is achieved by the artificial lighting, compared with 25 lum/sq ft by natural light.

Relay and metering boards are located at the rear of the control panels, this part of the control room being shut off by a curtain wall dropping from the ceiling to the circuit label carrier surmounting the control boards.

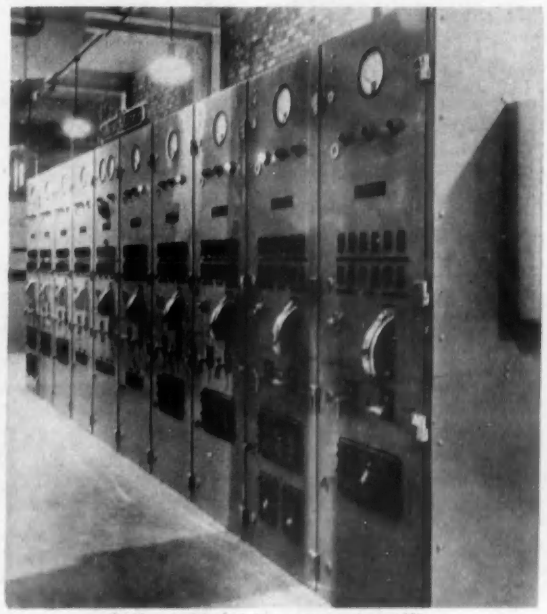
Electrical protection is provided by Merz Price relays on the alternator circuits with back up overcurrent protection. Feeders are protected by Solkor and overcurrent and earth fault inverse time delay relays. Buchholz devices are provided in lieu of Solkor relays on the auxiliary transformer circuits. The 11 kV system neutral is earthed via a metallic resistor limiting the earth fault current to approximately full load current. In the event of a persistent earth fault remaining uncleared on the system, arrangements are made for the resistor to be protected against burn-out by a thirty second inverse time delay relay in the neutral circuit arranged to trip all generation on the 11 kV bars.

The station d.c. supplies are obtained from a 240 V, 140 Ah lead acid battery maintained under trickle charge conditions by a charger incorporating metal oxide rectifiers operating on the Cycloc principle. The main d.c. board is of the combined switchfuse pattern and provided with a bus section switch with the battery incoming supply and solenoid supplies on the one side, and the incoming d.c. supply from the charger on the other. Trip supplies are duplicated from either side of the section switch. This

The cooling water jetty at low water

arrangement facilitates extensions by enabling either half of the d.c. busbars to be made dead as required. The battery also supplies power for an emergency lighting system. Lamps at key points are on a separate system from the main lighting and normally fed by a.c., but are automatically changed to d.c. should the a.c. fail. A separate 50 V battery is provided for telecommunications and the mosaic diagram control equipment.

The architect has done much to incorporate the basic local architectural motifs into the main buildings. The inverted buttresses and sun canopies over windows are particularly evident. The station building is steel framed, employing 18 in. thick outer brick walls. These are designed to absorb heat during the day and release it during the night, having sufficient thermal capacity to go some way towards smoothing out the daily temperature cycle. Three main expansion joints are incorporated in the building. In order to reduce troubles caused by ingress of dust and to give good general ventilation the whole building, except those parts which are air conditioned, is under plenum pressure at about $\frac{1}{4}$ in. water gauge, filtered air being provided by a 90 h.p. fan.



415 V switchboard in power station "A"

The first machine went on commercial load 19 months after site work commenced, during which time 18,400 cu yds of concrete and 1,000 tons of structural steelwork were installed, together with 56,000 yds of m.i.c.c. control and lighting cables, with 2,800 terminations. At times during the construction, humidity was such that a 500 V Megger on open circuit showed half a megohm, making cable jointing impossible due to the jointer's perspiration. Difficulties were also encountered in pulling 11 kV cables into ducts due to softening of the outer compound serving during the hours of daylight.

Power is sold to the public at 3 annas per unit (3·4 pence) and water at 4 gallons for half an anna. The principal function of these charges is to restrain the ever-growing demand and prevent waste.

Maintenance Facilities

Two other major installations within the power station compound are the meter testing wing and the main workshops. The meter testing wing is a fully air-conditioned, all-aluminium building, equipped for the testing of consumers electricity meters, test benches being available for both single and three-phase of up to 100 A, with a 3,000 A current transformer test set and an 11 kV voltage transformer test set. Sensitive potentiometer equipment is available for instrument calibration, the galvanometer being mounted on special foundations. A good wave form for all a.c. testing is ensured by a variable frequency motor generator set, the generator output being accurately sinusoidal. The design capacity of the wing is 5,000 meters per annum, tested and reconditioned.

The main workshops comprise a steelclad building having a floor area of 27,000 sq ft, together with a suite of air-conditioned offices, and is equipped to tackle repair work for the whole of the State. Refrigerators and air-conditioning plant constitute the main load and are dealt with on an assembly line basis. Sheet metal, welding and plating shops, machine shops and foundry, together with enamelling plant and electrical impregnating plant, enable the workshops to manufacture as well as to repair.

(to be continued)

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

Germicidal Tubes and Horticulture

I WAS very interested in the recent article by D. H. Holloway on "Germicidal Radiation" using ultra violet tubes. He mentioned its use for the destruction of micro organisms such as bacteria virus and mould; and discussed its interesting application in the food trades (also for the care of live stock).

I am wondering whether he, or any other reader, has heard of its uses in horticulture for the suppression of virus or mould infections, and diseases in greenhouses or other buildings. The use of ordinary tungsten lighting by flower growers for producing chrysanthemum blooms is well known as is also the use of electric lighting for plant irradiation. I cannot recall, however, ever hearing of the germicidal properties of ultra violet radiation being utilised.

J. E. Beadle.
POTTERS BAR, MIDDLESEX.

* * *

THE question as to why germicidal tubes have not been used extensively for the control of mould and virus in horticulture can be fully appreciated when it is realised that short wavelength UV is injurious to plants. Very low intensities that are permissible for instance on an infant's face, will produce a wilting effect on plant leaf, and in the case of species such as ivy, result in the destruction of the plant.

TUV tubes have however been used in a specialised branch of horticulture, namely the growing of orchids. These and some other forms of exotic plants are seeded under special conditions on sterile culture media, which may become overgrown with mould, either on the plant itself or on the media.

The possibility of infection from airborne mould spores can be substantially reduced by means of TUV germicidal upper air irradiation. It is essential in this instance that upper air irradiation should be used, as direct UV on the seeded cultures can effect damage.

D. H. Holloway,
Fluorescent & Discharge Lamp Dept.
PHILIPS ELECTRICAL LTD., LONDON, W.C.2.

Earth-Free Situations

I READ with great interest Mr W. Satchwill's article "Installing Ceiling Fittings" in "Problems and Practice" 14th July issue and "Earthing Lighting Fittings" (Reader's Views) 28th July issue, by Mr S. H. Pierce. I would like to say that I agree wholeheartedly with these remarks and understand the reason for the noun "Heaven" being used by Mr S. H. Pierce. However, I do not feel that "Heaven" would be a suitable expression to be included in "The Regulations for the Electrical Equipment of Buildings," 13th Edition of I.E.E., although I have the desire for "supreme happiness."

I personally would like to see the total omission of the definition of earth-free situation because in my view no place on earth can be deemed to be earth-free. With this belief in mind, I respectfully suggest that this and Reg. 1001(A) Exemptions No. 2—which states that: In earth-free situations the connection of an earth continuity conductor to the earth contact tube of a socket outlet may be omitted except where the socket-outlet is to supply portable appliances having exposed metalwork which are liable to be carried into non-earth-free situations while connected to that socket-outlet," should be amended. As previously stated exemptions in this and suchlike cases should not exist, as danger is embodied in such cases. May I, therefore, in conclusion and with all due respect, recommend that the following Regulations be given very careful consideration before the release of the 13th Edition of I.E.E. Regulations.

(1) No place on earth can be deemed to be earth-free.

(2) Wherever and whenever a socket-outlet with an earth contact is fixed or fitted it shall have an effective earth continuity conductor connected to its earth contact tube.

May I also respectfully suggest with reference to Section 11 Reg. 1102 (B) that when "Infinity" is used, this should be omitted from the 13th Edition and a more appropriate term used as is now used on instruments which previously bore "Infinity."

J. H. Robinson,
THORNTON, FIFE.

Wiring in Schools

THE Notes on Wiring by *Megohm*, relating to schools' installations, in your current issue are at the standard of competence and interest which we have come to expect from this writer.

In connection with wiring systems, however, it is surprising that he makes no mention of v.r. or p.v.c. insulated aluminium sheathed cables. Not only do these cables overcome the "sagging" of t.r.s., which he rightly deplores, but they lend themselves to the neat, workmanlike job which he feels may set an encouraging example to the child in other tasks.

Needless to say, the protection of an aluminium sheath will also daunt even the most enthusiastic small boy with a penknife!

C. W. Cawte,
Sales Manager (Cables).
JOHNSON AND PHILLIPS LTD., LONDON, W.C.2.

Car Battery Deterioration

I WONDER if some of your readers could help me? The majority of car batteries, I have been informed, deteriorate not so much due to electrical faults but due to vibration shaking loose the active material from the plate grids. This material becomes loose partially due to the heavy overloads of engine starting and partially because of the shaking. When the paste falls into the bottom of the battery, I am informed, it sulphates gradually and the sulphate having a much larger bulk than the original material, grows and ultimately shorts across the plates. If this sulphate can be removed, it would be reasonable to assume that the battery would continue to be useful although its capacity and its maximum discharge would be lower than normal.

Is there a way of removing this sulphate without having to lift out the plates?

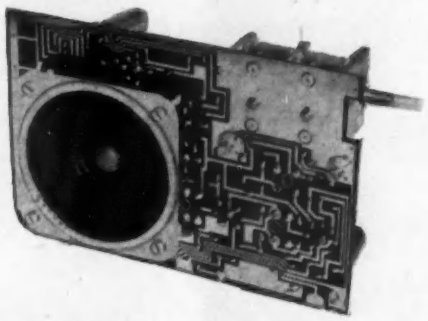
Motorist,
KINGSTON-ON-THAMES, SURREY.

Radio Trends 1955

HIGH FIDELITY, V.H.F./F.M. AND COMMERCIAL T.V. PROVE DOMINATING FACTORS

TWO major events have occurred to make this year's Radio Show the most interesting since the war. One is the rapidly approaching introduction of Commercial television on Band III, and the other is the great interest developing in high fidelity sound reproduction, both from the v.h.f., frequency-modulated transmissions and from recordings. It is thus particularly disappointing that due to labour troubles the Show should open late. (Friday, August 26, is the date now aimed at.)

In the television field it is natural that with the additional complexity of circuiting and tuning, manufacturers should have concentrated entirely on the two-band receiver suitable for I.T.A. programmes as well as the B.B.C.



An application of T.C.C. Printed Circuits illustrated in this 4 valve battery portable assembly

The trend toward the large tube continues, despite the alleged "coarseness" of the 405 line interlaced raster; now 14 in. models are taking second place to 17 in., and for the first time in this country the 21 in. tube receivers are appearing in quantity, in a variety of manufacturers' models, including ALBA, BAIRD, BUSH, DYNATRON, EKCO, ENGLISH ELECTRIC, FERGUSON, G.E.C., MASTERADIO, PHILIPS and others. The largest tube being shown is a 27 in. unit, reserved unfortunately for export only, and made by MAZDA.

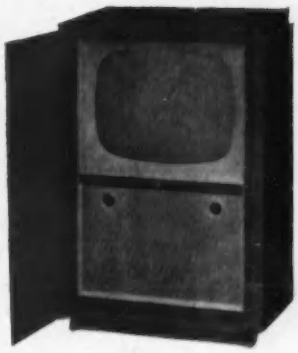
The circuit complications introduced by providing arrangements for tuning to 13 different carrier frequencies, which require new valves to handle the very high frequencies concerned with Band III, are extensive. Automatic gain control is needed both for vision and sound channel to compensate for variation in strength between the different transmitters; otherwise the viewer would need to adjust both contrast and brilliance every time he switched from one programme to another. In addition, with a multiplicity of transmitters, it is probable that the viewer will live in a "fringe" area associated with one or more programmes. Therefore more sets are being given maximum sensitivity, and have "flywheel" type picture-synchronising which enables synchronisation to be maintained even under conditions of virtually no signal. FERGUSON have, indeed, gone so far as to embody in their sets a switch controlling the time-constant of the "flywheel" circuit, so that the optimum setting can be attained to deal with local conditions.

General television improvements include better focus over the whole of the screen, due to developments in magnetic focusing, or the introduction of electrostatic focus (H.M.V. and KOLSTER-BRANDES), the almost universal inclusion of ion traps to prevent screen burning, and increased brilliance and contrast consequent on the perfection of aluminised screens. Practically every TV set maker is showing converters to enable the older sets to receive Band III programmes. Where the set is rapidly adaptable the price is usually 5 or 6 guineas, but when the converter has to provide its own power supply, the cost is about 10 guineas.

Some typical prices of television receivers may be quoted. G.E.C. have a contemporary design 14 in. receiver (BT 1252) at 65 gns. including p.t. The 17 in. table model BT 2745 is 77 gns. (inc. p.t.) and 17 in. console models are available in the range 93 to 102 gns. No price has yet been announced for the 21 in. model.

STELLA TELEVISION have the ST 6414U table receiver, 14 in. tube at 68 gns., and the ST 8517U 17 in. table model (price to be announced). PHILIPS' Model 1746U is a 17 in.

Pye's "Fenman" 11 radiogram is equipped for the reception of FM and AM transmissions



Philips 2157U 21 in. tube table television receiver incorporates a Philips Multi-Programme Turret Tuner for Bands I and III

table receiver with a picture size of 14 in. by 10½ in. and costs 78 gns., while the 1446U, a 14 in. model costs 66 gns. The PHILIPS 2157U console receiver incorporating a 21 in. aluminised tube, has not yet been announced for price.

It may, however, be generally assumed that 21 in. tube consoles will be fairly expensive—from about £110 upward. Two models priced in this class are the ENGLISH ELECTRIC C45, which uses 14 noval based valves, and four germanium crystals, and sells at £120. 15s. The C 45FM, which has additional facilities for receiving VHF/FM, sound sells at £126. The C 46 and CF 6FM in the same range have full length doors and sell at £131. 5s. and £136. 10s. respectively. PYE LTD. have also a new 21 in. television receiver priced at 115 gns.

Sound Radio

Last year saw sound radio entering a new phase with high fidelity reproduction. This is fortunately a field in which the customer's judgment must remain supreme, and as each customer has a different idea of fidelity, an indefinite search for perfection is assured. Theoretically, however, high-fidelity is amenable to a high degree of rigid analysis, and with the new VHF/FM service coming into fuller operation the audio bandwidth of 10 kc/s available—as compared with the more usual 4·5 kc/s—will enlarge the aural horizon of many listeners. In addition the interference-free characteristics of FM will present an ever increasing attraction. In design, FM receivers are more complex than AM types; and again the two functions of freedom from interference and high quality can be differentiated. New radio sets taking advantage mainly of the interference-free function, with incidentally better than ordinary quality are obtainable at prices in the 20-24 gns. range; the special high quality sets with their associated wide response speakers range from 38 gns. upwards. All these models, of course, can receive the ordinary amplitude modulated signals. In some cases the VHF band replaces the short wave band, and in others it is additional to the normal bands.

FM adaptors for converting ordinary sets and radiograms are not prolific. KOLSTER BRANDES have the FB 10FM, a frequency-modulated version of the FB 10 mains portable Magic Midget which has the advantage of being used as an adaptor or simple VHF/FM only set. Other adaptors have been made by firms specialising in high quality reproduction and are intended for use with amplifiers which can do full justice (DYNATRON, FERGUSON and H.M.V.)

Radiograms

The market for radiograms has been stimulated by the coming of VHF/FM. EKCO have two new table auto-radiograms, one, Model TRG 252 providing VHF reception. Another auto-radiogram from the same firm is the all-wave console model ARG 256 which includes FM. FERRANTI have two new models, the 355 at 59 gns. and the 455 at 79 gns. G.E.C. are also well to the front in this field with two new items, the BC 9640 at 75 gns. and the BC 9442 at 72 gns. Both these will receive VHF/FM.

For the connoisseur listener there are the "quality" models at 80-100 gns. An example here is the PHILIPS Model 653A (the Eroica) for the reception of both AM and VHF/FM programmes. This has a built in special dipole which acts as a plate aerial on the short wave. Two playing heads are provided, one with a diamond stylus for long playing records and one with a sapphire stylus for standard groove recordings. Practically all the radiograms now have space for record storing.

The combined radiogram-TV model remains scarce, although there is one model by REGENTONE at 159 gns.

Tape Recording

The use of tape recordings for high-fidelity reproduction continues to gain ground. Last year H.M.V. introduced tape records. This year, they are taking a bold step forward by producing tape records with twin tracks which, when reproduced through suitable twin-channel amplifiers and speakers, give a three-dimensional or stereophonic effect. They are also marketing a suitable twin console outfit that can be used to play the single track tape records and any kind of disc record.

Visitors to last year's show will also remember the remarkable demonstration staged by G.E.C. This year they are staging a large-scale 3-D stereophonic demonstration in which sounds not only appear to move across the audience as the previous year, but also move from back to front. Batteries of loudspeakers all round the walls and in the ceiling are used in conjunction with multi-channel tapes and high quality amplifiers, combine to give an effect startling in its realism.

Many types of tape recorders are shown varying widely in price, depending on the quality required and the facilities available. A unit for playback through a radio or radiogram, for example, can cost only 26 gns., and a popular complete transportable unit 35 gns. Both these are available from TAPE RECORDERS (Electronics). A precision engineering model with a frequency response of the order of 25–12,000 c/s is being shown by SIMON SOUND SERVICE.

Component Parts

Although, strictly speaking, a radio set cannot be a component in its own right, the new Philips "Moto Radio" Model 344V is nevertheless a component of a motor car. This 4-valve 2-waveband receiver with front dimensions of 7 in. by 2½ in., depth 7½ in. and height at back 3½ in., is permeability tuned, and is suitable for all types of car aerial. It can be simply converted from 12 to 6 V operation, without changing the vibrator, the dial bulb, and without the need for a soldering iron. Price complete is 21 gns.

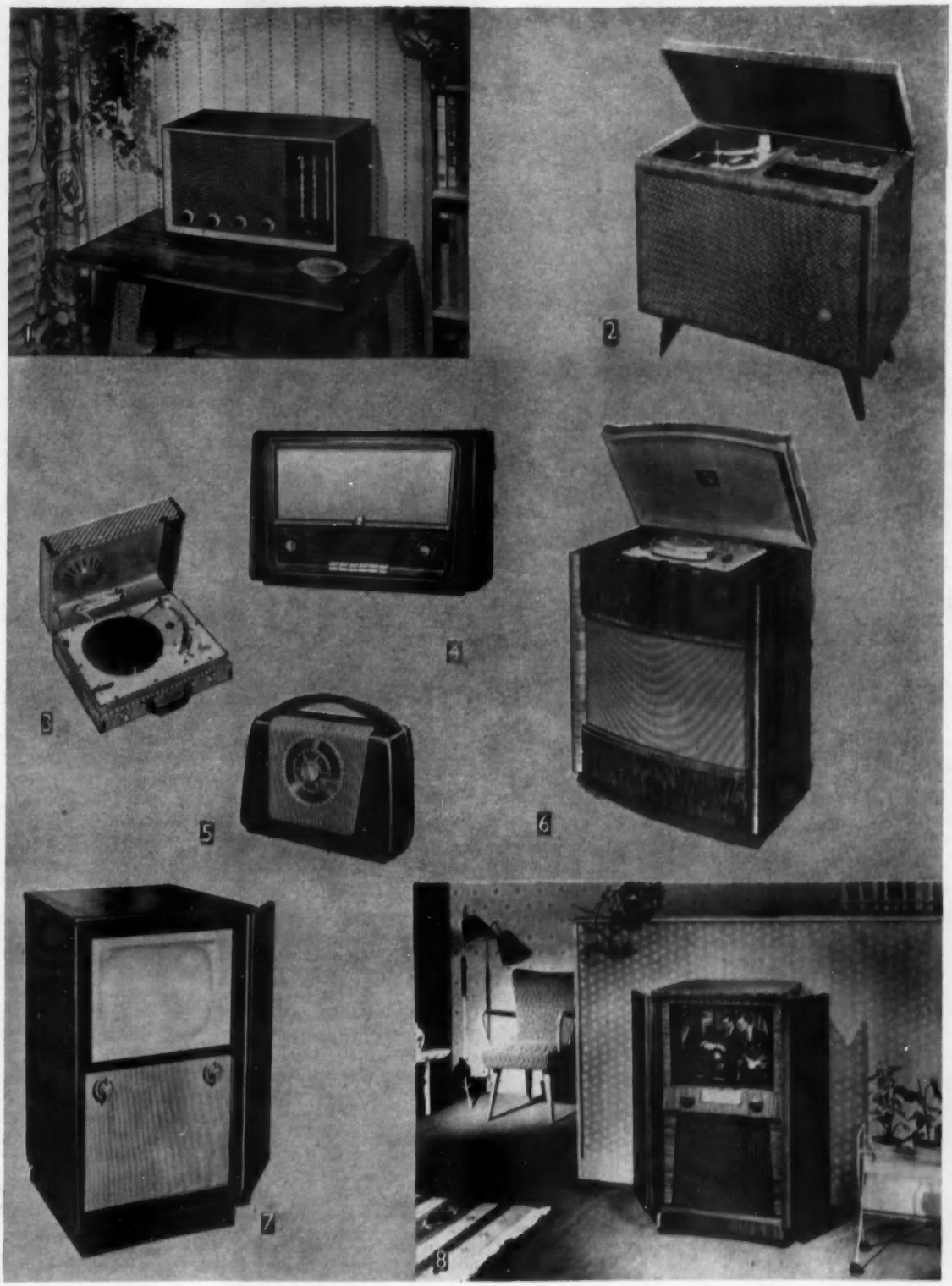
In the valve field, the GENERAL ELECTRIC CO. is showing latest miniature types of Osram valves as used in Band III television receivers and VHF/FM radio receivers. These include the 719 and 319 valve ranges. In addition, there are the "special service" type valves for use under arduous conditions, the CCT6 cold cathode trigger tube developed for electronic switching and a variety of power valves.

Television requirements are exemplified by the 14 in. 7203A and the 17 in. 7401A aluminised long-life tubes. There is also a new 21 in. aluminised tube with a 90° scan angle.

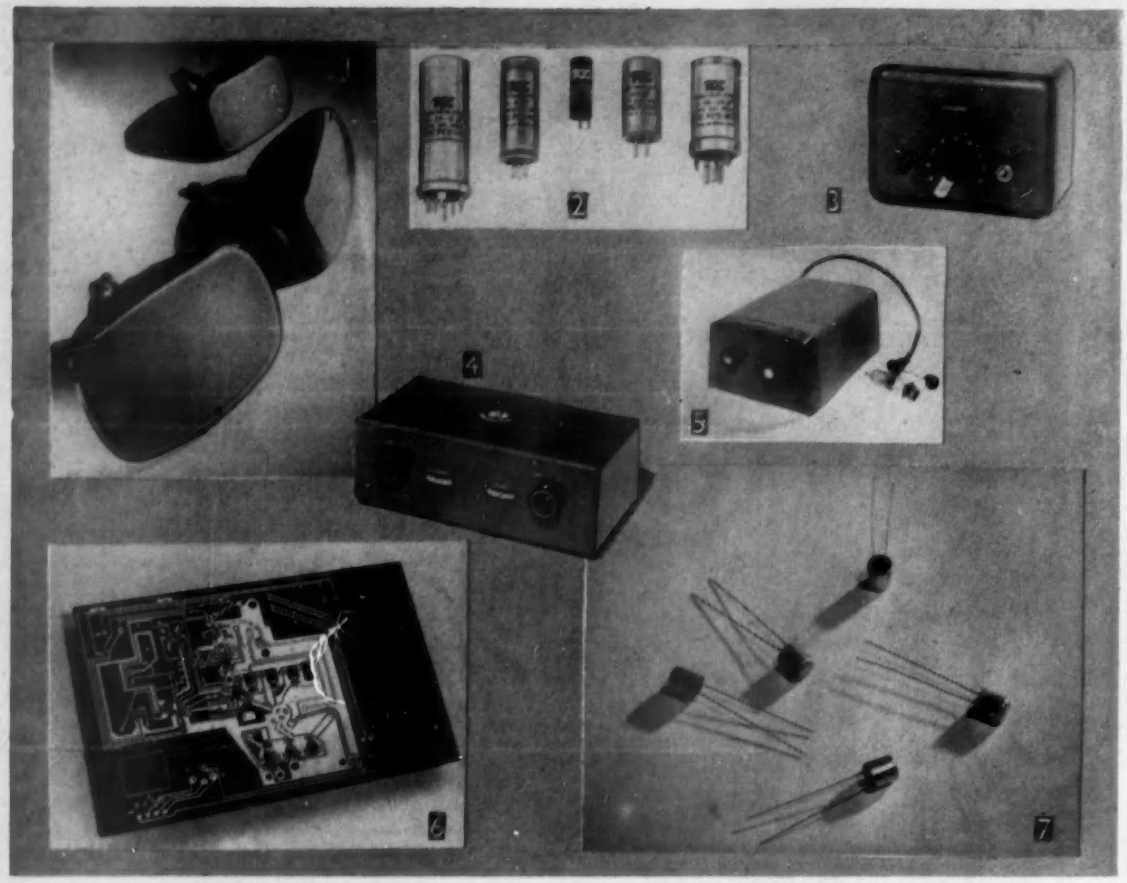
CHANNEL ELECTRONIC INDUSTRIES have an entirely new Band III converter which is pre-tuned to receive up to 9 programmes, one in Band I and 8 in Band III. It is claimed that this converter will be suitable for the great majority of old sets, and is particularly easy for the dealer to install. It costs 10 gns. Also by the same firm is a Band III preamplifier with a 24 db gain. This retails at £6 and is self-contained with its own power-pack.

The ENGLISH ELECTRIC "Rotomatic" 12-channel tuner is available to convert earlier single-channel receivers made by the firm into multi-band units.

DUBILIER CONDENSER CO. have a comprehensive exhibit of capacitors designed to meet the exacting requirements of modern radio, television and communication equipment including capacitors for use in printed circuits and other applications where miniaturisation is essential. Suppression capacitors form a large section of the range shown. In the resistor field there are precision wire wound fixed resistors, volume controls and potentiometers and



Left to Right. 1. Marconiphone Model T42A.—6 valve, 3 waveband F.M./A.M. receiver for a.c. mains. 2. This G.E.C. radiogram will receive F.M., V.H.F. as well as conventional medium and long wave. 3. Stella ST541A portable record player. 4. Philips model 543A A.M./V.H.F.-F.M. table radio receiver. 5. Ferguson mains/battery "all purpose" portable with finger spin tuning. Model 342BU. 6. "His Master's Voice" Model 3034: Stereosonic reproducer for new H.M.V. tape records. 7. English Electric Console model C42 Television receiver with 17in.tube with Rotomatic tuning selector for Band I Channel 1-5 and Band III Channel 8-9. 8. "His Master's Voice" Model 1843: 17 in. two-band a.c./d.c. receiver



Left to Right. 1. Ferranti rectangular cathode ray tubes. 2. T.C.C. condensers for specific application to printed circuits. 3. Channel Electronic Industries Ltd. Band 3 convertor. 4. E.M.I. Band 3 convertor type T.2211. 5. English Electric "Rotamatic" tuner. 6. Printed circuit of a.c. mains receiver by Printed Circuits Ltd., by the "Plasmet" process using "Delaron" material by De La Rue. 7. Ferranti silicon junction diodes

high stability resistors for a variety of applications.

THOMAS DE LA RUE AND CO. are giving prominence to "Delaron" Copper Clad laminate designed as a basis for printed circuits.

FERRANTI in their Electronics Exhibit are showing numerous valves for radio and television receivers, particularly for the reception of programmes in the ROO/Mc/s waveband, and for the reception of FM radio transmissions. Cathode ray tubes for receivers are available in all popular sizes from 9 in. dia. to 21 in. rectangular. Silicon junction diodes, claimed to be the first of such types to be made commercially available in Britain are prominently featured.

Rectifiers for high and low-power applications are shown by WESTINGHOUSE BRAKE AND SIGNAL CO. Emphasis this year is placed on special types such as germanium crystals, sub-miniature high-voltage and contact cooled units.

MULTICORE SOLDERS LTD. are showing by practical demonstrations how Ersin multicore solder is used in the manufacture of radio receivers. Operatives from the RADIO GRAMOPHONE DEVELOPMENT CO. will show visitors the complete wiring assembly and soldering of the new R.G.D. mains/battery portable radio receivers. A new line shown this year is a special size Home Constructors' Pack retailing at 2s. 6d.

The main theme of the T.C.C. exhibit is the development of new capacitors for television receivers incorporating Band III, Band IV and other multi-channel tuners. These are all in the Ceramic Group and consist of miniature Hi-K lead-through and stand-off condensers, and two low-K trimmers. The latter provide pre-set adjustment of R.F. and oscillator circuits in TV tuners where only small capacity sweeps are required. The "Superlytic" condensers allow, for the first time, the designer to think in terms of insulation resistance for electrolytic condensers. Part of the T.C.C. stand has been devoted to demonstrating the application and uses of printed circuits in the electronic industry.

No one can avoid marvelling at the tremendous range of BULGIN products which increases every year. The range covers switches, lampholders, connectors, plugs, sockets, knobs, dials, terminals, test prods, fuses, cutouts and so on.

A. H. HUNT are also most interested in the printed circuit field, and are showing a new process. They are also producing in addition to their normal range, special types of capacitors suitable for incorporation in printed circuits.

Tubes ranging from 21 in. rectangular down to a new 12 in. unit are among the wide range of valves being shown by MAZDA.

The Royal Navy have again taken a section and are showing an interesting comparison between the wireless office in a small warship and an old type installation as fitted in a ship during the years following World War I. They have also electrical machines which will play games.

notes on wiring

by Megohm

ONE of the main jobs in any electrical installation is the fixing of the conduit, cable and accessories. Particular attention should always be paid to neatness of cable and conduit runs, for this may well spoil an otherwise perfect installation. Of course the surface where these components are fixed may vary a dozen times in one installation and a careful study of the situations before the work commences is well worthwhile. I saw a very simple but ingenious system of fixing for cable, conduit or pipes being used recently, and feel that it is worthy of note by operatives.

Steel Support

Many hours must have been spent by draughtsmen in the early days to ensure a good fixing for cable runs. In the past, steel work for cabling consisted of pieces of channel, flat and angle steel and individual fixings had to be designed and manufactured. To-day, we have more adaptable methods which speed up the work considerably. I am thinking particularly of the system which employs a channel into which spring-loaded nuts are inserted and the various fitments added as necessary. The channel has two lips formed in it against which the special nut rests, and the nut has also two slots along the face into which the turned down edges of the channel lip fit. The nut will not turn because of this arrangement. A simple device, consisting of a handle with a projecting thread which screws into the nut, is employed to insert the spring-loaded nut into the channel. The channel, when mounted on a wall is secured by a clamp which has a spring-loaded nut assembly on one end and a drilled hole in the other. An ordinary fixing arrangement is used to fasten the clamp to the wall. With this arrangement of a clamp at each end of the channel, spring-loaded nuts can be moved freely along the length of the channel.

A cantilever support bracket arrangement can also be used with this type of rack, and again "simplicity" is the keyword. The bracket is arranged to fit into the vertical section of channel and to receive another length of channel at right angles to the vertical length. Another accessory is the fitting suitable for clamping the channel to upright or overhead girders. This consists of two angle brackets, slotted for the insertion of an arm of the required length. The brackets are drilled and tapped to accommodate bolts for tightening down on the girder. The channel is slipped through the slots in the brackets which are positioned on each side of the girder. The whole arrangement is then secured by tightening the bolts on to the girder. The cable cleats are then fixed in the normal way to the channel.

The manufacturers of this racking have also produced a new type of one-bolt fixing cleat for use with their patent racking. This cleat is neat in appearance and can be obtained in one- two- and four-way sizes.

Fixings

Keeping to this subject of fixings for a little while longer, I recently wandered into a bungalow, which was nearing completion, in the hope of finding something interesting. Little had been done to the electrical installation except that chases had been cut in the walls and all the switchboxes and socketboxes had been fixed into position by means of cement. This rather intrigued me, so I made a point of paying another visit to the bungalow some ten days later, when I was rather surprised to find that the lighting points had been installed in screwed conduit and the conduit taken down into the switchboxes and socketboxes as required. Now, as far as I could see from a casual look around, the installation was perfect but I have never seen the boxes installed prior to the conduit before. It may be that I am a little out of touch with the smaller dwelling installation, but I was always taught to fix the boxes when I was installing the conduit. Also, I always consider it necessary to secure a box to a wall by means of a screw. Closer examination of the boxes, however, revealed that the coupler on the end of the conduit into which a male brass brush was screwed, was not making full contact with the wall of the box due to the angle at which the conduit entered and was, in fact, only touching in one place. This was noted on every box except two switchboxes and one socketbox. These boxes were in order as far as earth continuity was concerned but, however, were damaged by the strain placed on them.

I called back at the site during the next week but work had ceased for the holidays, and when I did manage to visit the house again the plasterers had been and gone. I looked around again and found two boxes which were quite loose in the plaster, and I can only assume that these had been subjected to a blow and the box loosened in its cement fixing. I think I prefer the old method of installing the boxes at the same time as the conduit and making sure of a good connection to the wall of the box. It does not take long to fix the box with two screws and thus ensure safety and a good job.

Fatal Accidents

I noted with regret from the national press recently, two fatal accidents due to faulty electrical apparatus. One involved a kettle, the other a fire. Unfortunately *exact* details of the faults which caused these accidents are hard to obtain, but it would appear that a faulty flexible cord or a connector was the trouble in the case of the kettle, and a badly connected piece of apparatus the cause of the accident with the fire. I have often written of the need for good maintenance of domestic appliances and here again is cause for reflection on the matter. All too often the flexible cord on an appliance is neglected, until it is the cause of someone receiving a shock. The flexible cord is, in my opinion, the weak link in portable apparatus and should, therefore, receive regular attention. Kettle connectors, too, can be a source of danger for they receive a considerable amount of rough handling. The question is what can we do to educate the public? I feel that a nation-wide campaign for safety in the home by the electrical industry is long overdue.

Our report from Geneva continued by K. C. POUNDS
B.Sc.(Eng.) A.C.G.I., A.M.I.E.E.
Assistant Editor

THE NUCLEAR CONFERENCE

WORLD TRENDS IN REACTOR DESIGN DISCUSSED AT WEEK-END SESSIONS

NUCLEAR engineering has undoubtedly been greatly advanced by the International Conference on the Peaceful Uses of Atomic Energy, which closed at Geneva on Saturday last. The spirit of co-operation and goodwill which had been so marked in the opening sessions was continued through to the closing address by India's Dr Bhabha, the successful Conference president. Speaking then of the economics of nuclear power stations, which he said had been greatly clarified during the fortnight of work at Geneva, he forecast that as a direct result of the information made available at the Conference many countries may be expected to review future power needs.

That this co-operation and goodwill is to spread beyond the Conference period is everyone's hope, and a practical start is being made with visits to the Atomic Energy Research Establishment at Harwell this week, in which many nations, including Russia, are participating. There are reports as well that the chairman of the Russian delegation to Geneva has invited Sir John Cockcroft and the four other members of the official U.K. delegation (Sir Christopher Hinton, Sir George Thomson, Dr J. F. Loutit and Dr Willis Jackson) to visit Russia to see work under way there in the nuclear field.

Nucleonics and Power Supply

To return to the Conference itself, it is necessary to take up the story from last week's issue of the ELECTRICAL TIMES with a review of the papers devoted to power reactors, as distinct from research and materials testing reactors. These papers were grouped mainly on the middle Saturday and Monday of the Conference, and their presentation attracted large audiences in the main hall of the Palais des Nations, although there were two other sessions always in operation at the same time.

The opening sessions of the Conference on the Peaceful Uses of Atomic Energy were reported in last week's ELECTRICAL TIMES, *page 236 et seq. The heading picture above shows the British section of the commercial exhibition on opening day.*

Reactor Round-Up

It was very easy in the enthusiastic atmosphere of Geneva to talk as though power reactors of many advanced designs were already operating. This is far from being so. The only reactors known to have generated electricity at megawatt levels are those of Russia (5 MW), the U.S.A. boiling water reactor (3·5 MW), and indirectly and irregularly, the prototype for the U.S. submarine reactor. Most of the reactors described at Geneva were designs on paper only; already the subject of experimental work, but years away still as economic units in daily power operation.

The following notes summarise the status of the power reactors mentioned at Geneva. They have been, or will be, described at greater length elsewhere in the ELECTRICAL TIMES. Reactors offering purely research facilities are excluded from the list, which is arranged under countries and reactor types.

Canada

Slightly enriched uranium, heavy water moderated and cooled. Known as N.P.D., a reactor is now being designed in detail to begin operation in 1958 as an experimental power station, generating 10–20 MW electricity. A preliminary design study of a 100 MW station of this type is to be carried out at the same time.

France

Natural uranium, graphite moderated, gas cooled. A reactor intended mainly for the production of plutonium

but rated at 5·7 MW electrical is under construction, and should be in operation shortly after July, 1956. Further reactors of 50–70 MW are expected to be in operation by 1958 and 1959.

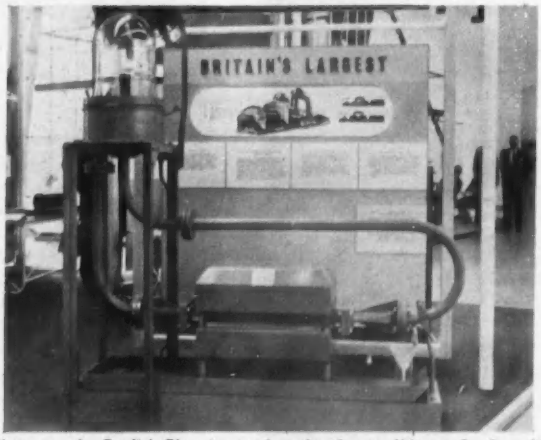
Netherlands

Uranium oxide, heavy water moderated, homogeneous. Proposal to build a small (250 kW heat rating) reactor of this advanced type. Zero energy experiment on reactor design is to start this year.

Uranium oxide, suspended in a gas, heavy water moderated, heterogeneous. Design studies are being made for a 300 MW thermal power reactor of this advanced type. No full scale experiments have been announced.

Norway

Slightly enriched uranium, heavy water moderated boiling design. Proposal for construction of a 5·9 MW electric output reactor, to be built into a mountain-side. Design programme now under way, no dates given for building.



Shown on the English Electric stand at the Geneva "Atoms for Peace" Exhibition was this liquid metal pump. It was demonstrated pumping mercury, but in industrial use it will handle sodium at 150° C at a flow rate of 200 g.p.m. against a pressure of 23 lb/sq in. Liquid metal linear induction pumps are to be used in Britain's Dounreay nuclear power station project

Russia

Highly enriched uranium, graphite moderated, light water cooled. Station operating since June 1954, rated at 5 MW electric. Plans reported for scaled-up version at 100 MW to be in operation next year.

Uranium oxide, heavy or light water moderated boiling, homogeneous. Paper read suggests that detailed design studies for such a reactor are being made. No size or date was mentioned.

United Kingdom

Natural uranium, graphite moderated, carbon dioxide cooled. Station to be operating next year, the over-riding purpose being the production of plutonium. Two reactors will deliver over 50 MW electrical. Plans for twelve stations of improved design, "optimised," for electricity generation rather than plutonium, to come into operation between 1960 and 1965 and for six more reactors of the "plutonium primarily" type.

Enriched uranium, fast breeder, sodium cooled. Large scale prototype for 60 MW heat rating, "tens of megawatts" electrical is now being built (Dounreay). Operation provisionally for 1959. Zero energy model of this (ZEUS) is operating at Harwell.

Enriched uranium, water moderated. Stated to be now under study and to show considerable promise as a possible successor to Calder Hall type. Dates not given.

United States

Slightly enriched uranium, graphite moderated, water cooled. Design study based on plutonium production reactors. Not thought competitive for most of U.S.

Highly enriched uranium, light water moderated and cooled. Known as the Pressurised Water Reactor (PWR), this design is now being used in the 60 MW electric station under construction at Shippingport, Pennsylvania. It is the type of reactor used in the U.S. Navy submarine *Nautilus*. Essentially experimental, not economic. Completion scheduled for 1957.

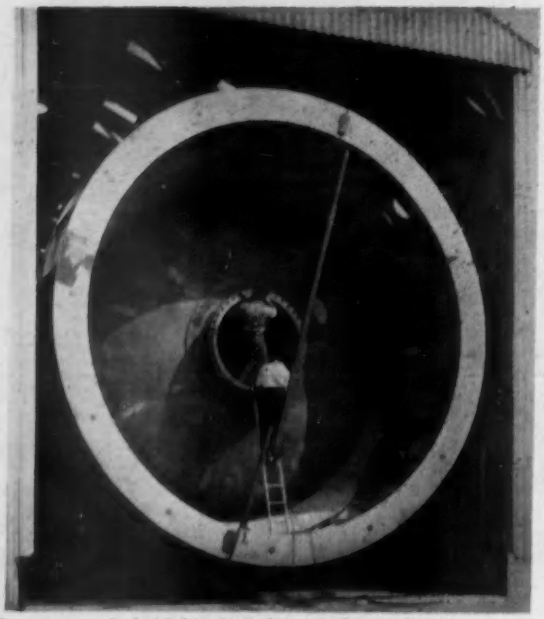
Applications to build further reactors of this type have been made by two supply companies. Consolidated Edison in New York State (236 MW, including oil-fired superheater—scheduled operating date 1960) and Yankee Atomic Electric Co., Massachusetts. 100 MW—discussion proceeding with the U.S. Atomic Energy Commission.

Slightly enriched uranium, graphite moderated, sodium cooled. Experimental reactor (20 MW heat—no electricity) now being built, with completion scheduled early 1956, and operation some time later. Engineering design study proceeding on 75 MW electric design, no date stated.

A proposal by a Nebraska company to build a 75 MW station is under discussion with the U.S. Atomic Energy Commission. No date given.

Enriched uranium fueled, water boiling. Reactor 15 MW heat rating, 3·5 MW electric is operating, using fully enriched uranium and light water. Design work and construction is proceeding on a 20 MW heat rating, 5 MW electric experimental station using moderately enriched uranium fuel and light water. Design studies have been made for a 1,000 MW heat rating heavy water moderated boiling reactor.

Leading attraction in the grounds of the Palais des Nations, the Conference headquarters, this "swimming pool" experimental reactor built by the U.S. Union Carbon and Carbide Corpn. has now been sold at reduced price to the Swiss Government under President Eisenhower's atoms for peace programme. The glow comes from the radioactive core of the reactor, and was readily visible to visitors



Pressure vessels for Calder Hall, Britain's first nuclear power station were fabricated on site. Here work is seen in progress on one of the four 80 ft steam-raising heat exchangers which are installed with each reactor

Aqueous Homogenous. Experimental reactor of small size has operated. Larger experimental reactor to give 5–10 MW heat output is now being built. It will use a solution of highly enriched uranyl sulphate, in heavy water. Some electricity may be generated. Design studies have been prepared for a 100 MW electric plant, but there is no immediate prospect of its construction.

Fast Breeders. Enriched uranium fueled sodium-potassium alloy cooled experimental reactor has operated at maximum heat output of 1·4 MW. A plutonium-fueled sodium cooled reactor of 20 MW electric rating is in the engineering design and development stage, with construction scheduled to begin in 1956 and operation for 1958.

The Detroit Edison Co. have applied to the U.S. Atomic Energy Authority for permission to build a 100 MW unit, fueled with enriched uranium. Operation would be planned for late 1959.

Liquid Metal Reactor. Design studies have been made for a 210 MW electric reactor using as a fuel a solution of uranium in bismuth. Early experimental work on components should start in 1956, and work on an experimental reactor by 1958, perhaps of 10 to 50 MW. Breeding versions in large sizes may appear in the early 1960's.

Dual light water moderated and cooled. The Commonwealth Edison Co., of Chicago, have proposed a reactor using pressurised water and flashing off steam. Completion date 1960, but a pilot reactor would be built first.

Calder Hall

Britain's first nuclear power station was described to the conference last week by Sir Christopher Hinton, Deputy Chairman, U.K. Atomic Energy Commission. In contrast to most of the papers presented by other countries, this had relatively little to say about the nuclear design—indeed, Sir Christopher declined directly to answer a question about fuel rod construction, saying it was a matter of commercial interest. Rather, the paper was an account of the construction of the station, with full attention to the civil and mechanical engineering structural problems that had to be overcome. There was constant reference to the information given in the White Paper on the British nuclear power production plan, which was summarised in THE ELECTRICAL TIMES on 24 February, 1955.

Calder Hall reactors are of course of the graphite moderated gas cooled type, using natural or very slightly enriched uranium fuel. In considering those actually being built at Calder Hall, it has to be borne in mind that production of electricity is not their main purpose; they are designed rather to give optimum production of plutonium for military purposes, and only indirectly to generate electricity. However, only detailed changes in the design are necessary to give the electrically more efficient stations such as will be built for the C.E.A.

In order that the heat may be extracted from the Calder Hall reactors in useful amounts at useable temperatures, pressurisation is necessary. This entails arranging supports for a mass of graphite moderator weighing over 1,000 tons, within a pressure vessel. The present vessel is made of 2 in. steel plate, welded on site to give a cylindrical vessel 40 ft in diameter by 60 ft high. After the welding had been completed, stress relieving was considered necessary, and this was achieved by radiant heating which required a peak electrical load of about 1·5 MW of heaters within the vessel.

Control rods and shut off rods are made of stainless steel tubes, lined with boron steel fillers. They are suspended from the roof of the reactor.

Carbon dioxide is used as the coolant, a compromise choice, partly determined by the expense of helium and its lack of ready availability in this country. Hot carbon dioxide is led away from the top of the pressure vessel by four 4 ft 6 in. diameter circular mild steel ducts, and taken to the heat exchangers which are arranged one at each corner of the reactor building. Cool carbon dioxide from the base of each heat exchanger is boosted in pressure by blowers powered by 2,000 h.p. motors. These have a Ward-Leonard drive at present, but it is stated that this feature will not be repeated in future reactors. The blowers are of the single stage centrifugal type with overhung impellers. Over 20 tons of carbon dioxide, obtained in solid form, is required to fill the reactor.

Each of the four heat exchangers is contained in a vertical steel pressure vessel of 1 5/16 in. steel plate. These vessels are about 18 ft in diameter and 70 ft high. They contain 30,000 sq ft of water heating surface, comprising high pressure and low pressure economiser, evaporator and superheater sections made of 2 in. o.d. mild steel tubing. The gas surface of the tube is extended by the use of elliptical steel studs. In the evaporator section of the exchangers, electrically-driven pumps maintain circulation. Each evaporator has a single steam drum 4 ft in diameter and 18 ft long, containing conventional cyclones and scrubbers.

High pressure and low pressure have been mentioned. The reference is to the extraction of steam at high pressure and temperature for feeding into the h.p. cylinder of the associated turbine, while the greater part of the steam goes directly to the low pressure cylinder. The choice of the dual pressure arrangement with its obvious complications follows from the top temperature of the exit gas from the reactor being fixed by reactor design considerations. A compromise to save capital expenditure on the turbine has to be considered. The high pressure steam is taken off at 200 lb/sq in. and the low pressure steam at 50 lb/sq in. Consideration was given to the use of an oil-fired external superheater to improve the thermodynamic cycle, but it was decided that the additional complications this would involve were not justified.

The turbines installed at Calder Hall are two-cylinder reaction machines of established design. The low pressure

cylinders have twin exhausts, the exhaust pressure being 1¼ in. Hg. After passage through the deaerator, h.p. and l.p. feed pumps return the water to the respective economisers. There is no mention of feed heaters. A separate dump condenser is provided for use when starting up the reactor, and on other necessary occasions. It is capable of handling the full load steam output of the station.

Alternators are 23 MW, 11 kV, 3,000 r.p.m. machines again of conventional design.

Future Improvements

Looking at possible future developments of the Calder Hall type of reactor, Sir Christopher said it was now considered possible to weld on site pressure vessels of the size required with plates up to three inches thickness. This would enable working pressures to be increased for a given size of pressure vessel, or alternatively, permit the use of a larger pressure vessel and thus a larger core.

Another possible approach is to substitute a spherical shell for the present cylindrical pressure vessel. This would double the diameter possible with a given pressure and thickness of plate, though at the cost of difficulties in supporting the graphite core and siting the biological shield.

Other coolants than carbon dioxide might be considered. Helium has been mentioned. Another gas attractive in many ways is hydrogen. Its use would decrease the pumping power required to about one-tenth of that with carbon dioxide, and since it is a good moderator, it would give some saving in graphite. It has the disadvantages of reacting with uranium at certain temperatures, however, and of diffusing rather easily into metals.

In the more conventional engineering field, Sir Christopher considers that much improvement can be made in the design of heat exchangers. They can be made lighter, with great advantages for site handling, and more efficient for extracting heat from a completely clean gas.

Sir Christopher claimed for the gas-cooled, graphite-moderated reactor power station a considerable future because of their reliability and almost conventional design. Combined with detailed improvements in efficiency this would make them useful for many years to come.

Dounreay Fast Reactor Project

When natural uranium is burnt in a nuclear reactor, it is possible to use only a few per cent of its total weight. Yet the energy potentially available in the non-fissionable U238 is little different from that of U235. Ultimately, a fuel cycle that can use all the uranium may be attractive, and it is this idea that is behind the work which the U.K. Atomic Energy Authority is carrying out at Dounreay in Scotland. The nuclear power station being built there is described in a paper by Messrs J. W. Kendall and T. M. Fry (Risley and Harwell respectively.

The first point that must be clarified about Dounreay is that it is an experiment. Electricity will be generated, but this will be incidental to the main product of the station, which will be information on how to build and operate a large fast breeder power station. The electricity rating of the station should be some tens of megawatts.

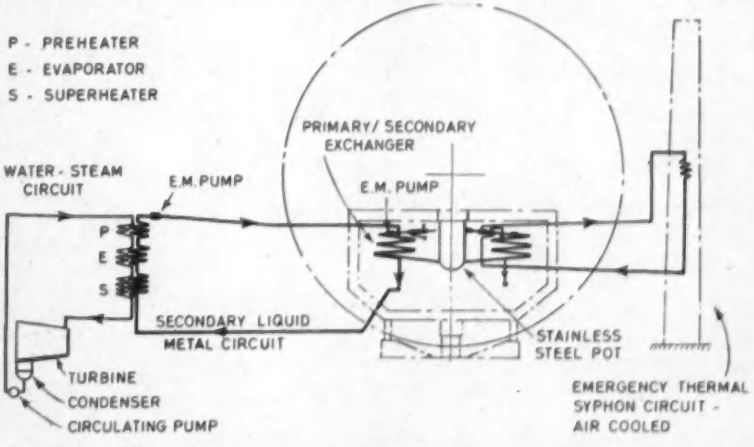
The authors set four requirements for a fast breeder reactor. Because it must be fuelled initially almost entirely with U235 or Pu239, substances whose costs are measured in thousands of pounds per kilogram, each kilogram of material must be made to yield many hundred kilowatts of electric power. Moreover, the outlet temperature from the reactor must be high enough to enable good thermal efficiencies to be obtained in the associated steam plant. From time to time the fuel used in the reactor will have to be processed to remove impurities, and since this is expensive, it is desired to reduce the frequency of this operation as much as possible. Finally, the reactor must, of course, be safe.

Dounreay is being built to enable the answers to these requirements to be found. As the diagram shows, the reactor is essentially a stainless steel pot to which are connected heat exchangers. The arrangements of the fuel within the pot is one of the main matters to be decided by experiment. The pot gives a core size of about 2 ft diameter and 2 ft high, and arrangements have to be made to get 60 MW of heat away from this small volume. A blanket of fertile fuel for breeding will be placed around the core.

The cooling method is to provide 24 parallel loops, each comprising two separate heat exchanger sections and an electromagnetic pump for moving the sodium coolant. The lower part of each loop will be jacketed, with the sodium of the secondary circuit flowing through this jacket. Stainless steel construction is used throughout to minimise corrosion troubles. Another jacketed section at the top of the heat exchangers provides for the rejection of heat to the air should a total failure of electricity supplies shut down the pumps.

The primary coolant is of course radioactive, and thus a heat exchange to a secondary, non-radioactive circuit becomes advisable. The use of water in this circuit is ruled out on safety grounds. If some leakage between primary and secondary cooling circuits occurred, then there might be an explosive chemical reaction between sodium and water if the latter were used. This would create a serious hazard by spreading the radioactive primary sodium around. So the secondary circuit coolant is again sodium. This in turn will give heat to evaporate water and superheat steam in a third heat exchanger.

To prevent the secondary sodium coolant from becoming radioactive, it is necessary to shield the heat exchangers from the core pot. Shielding is provided by a wall of graphite in which boron, an excellent absorber of neutrons has been introduced. The alternative to the borated



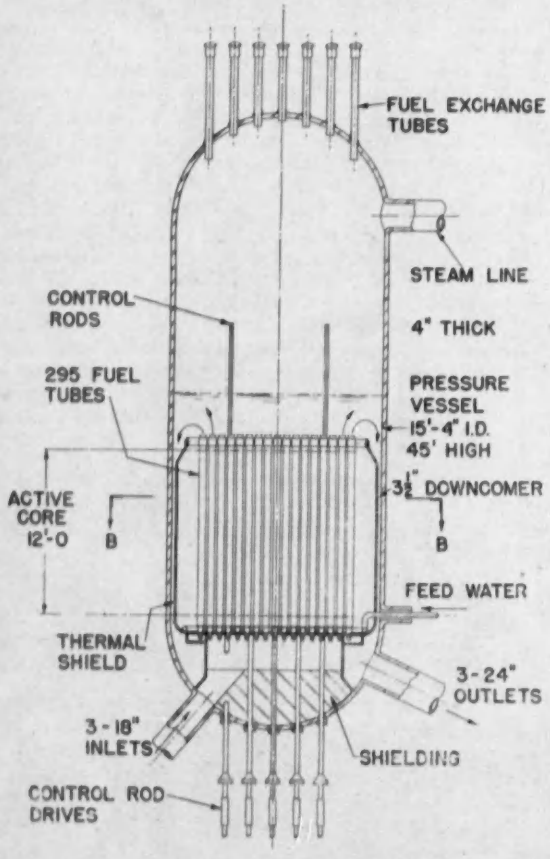
Arrangements of liquid metal and steam circuits for the Dounreay experimental fast reactor are here shown diagrammatically. Particular points of interest are the stainless steel core cylinder, about 2 ft diameter and 2 ft high, and the chain dotted concrete bowl, which is 5 ft thick. The 135 ft diameter steel containing sphere is shown in outline

graphite could be steel, which would become more radioactive, and would produce difficulties if the shield had to be dismantled at any time. The graphite wall is 4 ft thick.

The graphite and the core pot will stand in a concrete bowl of outside diameter about 90 ft, 45 ft high, and having a minimum thickness of 5 ft. This bowl is provided with a roof slab, from which the heat exchangers will hang. Around the whole structure is placed a steel sphere, 135 ft diameter and about 1 in. thick. If an explosion occurs due to the reactor getting out of control, the shield will be of little use; but it is considered that the control equipment can prevent any such happening. The purpose of the sphere is to prevent the spread of fission products and the loss of fuel if a fire should start for some reason within the reactor, and be fed by the large amount of sodium present.

In the initial experiments with this reactor, some potassium will be mixed with the sodium to lower the freezing point of the coolant. Sodium on its own is much to be preferred, however, and eventually the whole of the vault in which the heat exchangers are sited will be made into a hot box and sodium used alone as a coolant.

Although no information about the core of the Dounreay reactor is given in this paper, it has been announced here that a full scale zero-energy version has been built. Known as ZEUS, this will be used for the study of neutron characteristics, critical condition, and control calibrations of the Dounreay reactor. Zeus has a core consisting of an assembly of vertical tubes containing pellets of highly enriched uranium (40–50% U235 instead of the usual 0·7%) mixed with natural uranium pellets, the mixture ration being variable. An envelope of natural uranium rods mounted vertically surrounds this core. Control is effected by the movement of fuel rods near the boundary of the core.



A possible reactor design of the future is shown in this vertical section through a possible 1,000 MW heat rating heavy water boiling reactor. The top of the 4 in. thick pressure vessel acts as a steam drum. Two 140 MW turbo-alternators might be supplied with 600 lb/sq in. steam. Note that control rods are operated from below the reactor

Heavy Water Reactors

Heavy water is an exceptionally good moderator for use in nuclear reactors. It slows down the neutrons quickly to the required speed, and it wastes relatively few of them by useless absorption. This leads engineers of the U.S. Argonne National Laboratory to claim that heavy water is the only moderator which can be seriously considered in a high performance power reactor using natural uranium. The chief disadvantage of heavy water has been its high cost, and the consequent need to take extreme precautions to ensure that none is wasted. This in turn increases the cost of pumping and containing equipment. However, it now seems that the price of heavy water is likely to fall.

Size is important in securing economy, and a design is put forward for a reactor rated at 1,000 MW heat, giving about 250 MW electrical output. The reactor suggested is of the boiling type, operating at 600 lb/sq in. absolute. Fuel plates are of natural uranium clad with an alloy of zirconium. They are arranged in clusters held together by a zirconium tube, the heavy water flowing upwards over the fuel plates and being heated, so that by the time it reaches the top it contains about 20% steam by volume.

Power output achieved is about 0·38 MW per foot of fuel assembly, and the design suggested has 3,550 ft of assemblies arranged in a 12 ft diameter lattice of 295 assemblies, each having an active length of 12 ft. Control is provided by Y-section rods. Total weight of natural uranium is 43 tons.

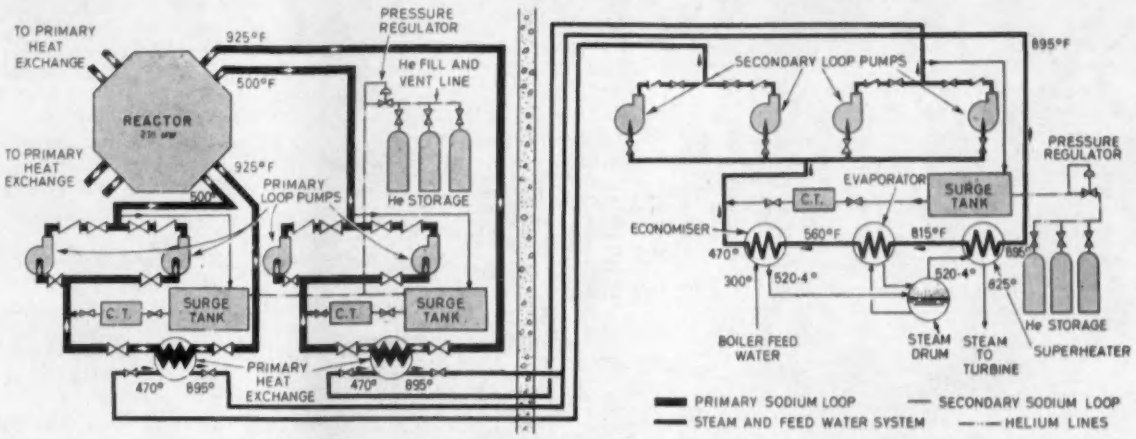
The core is contained in 4 in. thick pressure vessel, of about 15 ft diameter and 45 ft high. Normally water comes about half way up this, a steam dome being formed by the rest of the pressure vessel. The steam is led off to a steam separator and then to turbines. Estimated cost of electricity from such a plant might be as low as 0·77 cents/kWh. This assumes that 0·9 plutonium atoms will be formed for every U235 atom consumed. It is hoped that the fuel rods can be left in the reactor for 10,000 MW days per ton irradiation.

Modified designs are presented in the paper for smaller reactors using heavy water boiling. Their total production costs are considerably higher, and they make some use of concentrated U235. It should be noted that with this type of reactor, turbines designed to use relatively wet steam are necessary. There is no superheat.

Sodium Graphite Reactors

The graphite moderated natural uranium fueled reactor is the simplest conception of all. The major problem it introduces, is how to get the heat generated by nuclear fission away from the reactor at a high enough temperature to be useful in a heat engine. One method is to use a liquid metal as a coolant, and a reactor and associated power plant using this method was described to the conference by Mr C. Starr, of North American Aviation Inc. At present this company is building an experimental model of such a reactor with a 20 MW heat rating, but the paper describes designs developed for a 75 MW electrical rating station, which will follow on the experimental project.

The sodium cooled graphite moderated reactor as at present envisaged can give steam temperatures at 825° F. and it is hoped to be able to develop it to give 950° F. This temperature, it should be noted, can be obtained



Schematic flow diagram for a proposed 75 MW power station using a sodium cooled graphite moderated reactor. The reactor core is contained in a large diameter steel tank located below ground and cooled by liquid sodium

without the need to construct a high pressure casing for the reactor.

Sodium does have some disadvantages. In particular, it will react chemically with water and oxygen. For this reason, it is not possible to take the reactor and coolant directly to the water boiler. Another sodium circuit and heat exchanger must be interposed. Further, the sodium when exposed to neutrons becomes an emitter of gamma rays with an appreciable half-life.

At present a 20 MW (thermal) reactor is being built to obtain more information. It should be fully operative early next year. It will be followed by a sodium graphite reactor having an electrical rating of 75 MW. This 75 MW station is described in the paper.

The reactor core is contained in a large diameter stainless steel tank placed below ground. The sodium coolant flows through the tank in four quadrants, so that any one loop may be worked on without shutting down the whole plant.

For the uranium fuelled reactor, the present core design envisages an array of closely packed canned hexagonal graphite cells. The cells are enclosed in thin zirconium cans because graphite is porous to sodium. Each cell has a central cylindrical hole, in which a cylindrical fuel element is placed. Sodium coolant flows down the annular space left between element and graphite. Fuel elements are built up of slightly enriched uranium fuel slugs, each about ½ in. diameter by 12 in. long, assembled into fuel elements contained in cylindrical stainless steel jackets having a wall 0·010 in. thick. Fuel elements are about 10 ft long.

In this reactor, the zirconium temperature is limited to 950° F and the uranium temperature to 1200° F. A mean bulk outlet sodium temperature of 925° F is aimed at. With present temperature limits, steam conditions at turbine stop valve will be 800 lb/sq in. at 825° F.

Control rods consist of stainless steel rods surrounded by boron rings. They pass down into the cylindrical holes of the graphite lattice elements. At start-up, the core will have 215 channels loaded with fuel elements, this loading providing for an initial excess reactivity of 2%. The initial conversion ratio will be 0·72 atoms of plutonium for each atom of U235 burnt. It is hoped to obtain 3,000 MWD/ton irradiation.

Thorium Fuel

There is a possibility that this design of reactor may be suitable for working with thorium-U235 elements. In this case, the required atomic fraction of U235 in the thorium should be 3·70%. Fuel elements would be generally similar to those used with uranium, though with differences of size. The fuel slugs would consist of a U235-thorium alloy. The same arrangement of canned graphite hexagons would be used, arranged to give a 10 ft diameter by 10 ft high lattice of moderator elements.

The reactor is reckoned to be conservatively designed, but with the use of an initial loading of 360·4 kg of U235, it is calculated that the conversion ratio (atoms of U233 formed from thorium for every atom of U235 consumed) should eventually level off at 0·81. This would only be attained after several cycles at the end of each of which the irradiated material is removed from the reactor and sent for chemical processing. At each cycle some U235 and thorium will have to be added to restore excess reactivity.

The experimental reactor mentioned earlier was described in another paper to the conference. Amongst the interesting points of construction it presents is the use of mechanical rather than electromagnetic pumps for circulating the sodium.

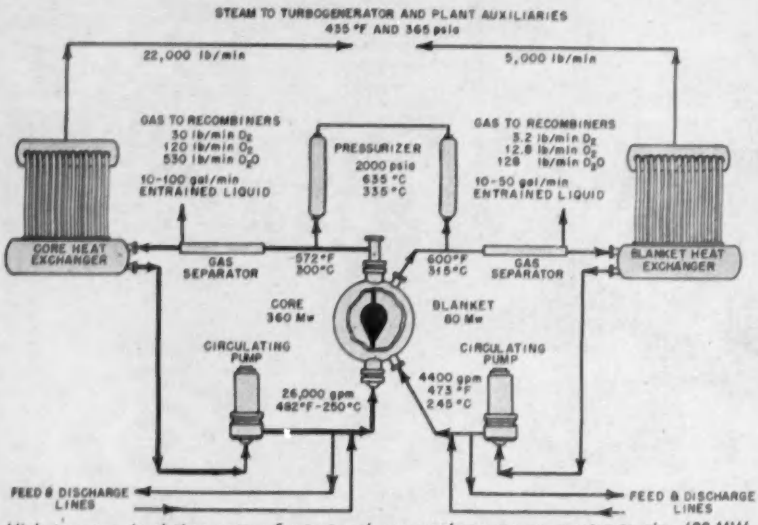
The hope is expressed that with developments stemming from experience with this type of reactor, self-sustaining fuel economy might be obtained with the thorium arrangement, with a total electricity cost of 0·6 cents/kWh.

Homogeneous Reactors

Homogeneous reactors, using either suspensions or solutions of uranium compounds in a liquid moderator offer the great advantage that the difficult problems associated with canning of fuel elements are avoided. Several reactors of this type were described to the Conference. The Dutch, for example, are planning to build a small scale prototpye of a reactor fuelled with a uranium oxide suspension in heavy water.

Careful control of particle size will be necessary to give a good chance of gaseous fission products escaping from the grains. The size will be between 5 and 12 microns. The removal of the fission fragment poisons can be made by adsorption on active charcoal or silicon. The problem also arises of doing something about the oxygen and hydrogen into which the water is split under the effect of neutron irradiation.

The plan for a 250 kW prototype reactor proposes that the suspension shall be thoroughly mixed in a special chamber. It flows upwards through a reactor vessel, into a gas separator, then a pump for maintaining the suspension, and finally into a heat exchanger before returning to the reactor. The reactor will be surrounded by a reflector of beryllium oxide. Provision is made for mixing



High pressure circulating system for proposed aqueous homogeneous reactor to give 100 MW electric. Note the recombiners necessary to deal with the break-up of heavy water under the effect of neutron irradiation

the decomposed water (oxygen and hydrogen) with such a large amount of gas that no explosion can take place. The valuable heavy hydrogen and the oxygen are then recombined catalytically. A by-pass is provided to permit removal of some of the zenon which acts as a neutron-absorbing poison.

Regulation of temperature is carried out by adjusting the concentration of uranium oxide in the heavy water. The reactor is to operate at 250° C slightly enriched uranium.

The Russians described another homogeneous reactor in which the suspension water is allowed to boil, only steam being removed from the reactor vessel. Either light or heavy water may be used as a moderator. The reflector is a suspension of thorium in heavy water. Concentration of fissionable material in the heavy water may reach several hundred kg/ton, but experience has shown that such suspensions still behave as a fluid. Even given boiling conditions, the solids do not separate out.

The gaseous fission products which accumulate as the reaction proceeds are separated out at the heat exchanger stage. Solid fission products which go into solution or remain in suspension are removed by bleeding off small quantities of the suspension to a chemical treatment plant. To some extent, the reactor is self-regulating as against varying turbine load.

100 MW Boiling Design

In the United States, an experimental homogeneous reactor had been operated at a low power, and further prototypes are being built. In a paper presented by R. B. Briggs and J. A. Swartout of the Oak Ridge National Laboratory, a design is outlined for a 100 MW station using a homogeneous reactor in which the water is allowed to boil.

Summarising the advantages of the aqueous homogeneous reactor, the authors point out that they can have a high power density and operate with a relatively small amount of fuel. Reactor fuels can be processed continuously to remove fission products and the results of radiation damage, and this should give a high burn-up of fuel. Reactors of this type possess a very high degree of nuclear stability, changes in operating conditions over a large range being secured by adjusting the fuel concentration. The reactors have a strong negative temperature characteristic, which improves their safety. Finally, there is no need to waste neutrons because of the presence of structural materials in the core of the reactor.

Disadvantages of the design include the need to operate at high pressure if the high temperature required for thermodynamic efficiency is to be attained. At such temperature and pressure, there are large volumes of extremely radioactive materials, and special provision must be made for containing them should they leak. Further, pumps, heat exchangers, etc., are made radioactive by these materials, and so difficult to repair, while at the same time the chance of corrosion and erosion is increased by this radioactivity. Finally, the heavy water used, as mentioned before, splits into deuterium and oxygen under the influence of neutrons. It must be recombined safely.

In spite of the fact that many problems remain to be solved the authors consider that this reactor is amongst the most promising from the economic aspect.

The reactor they propose is shown on this page. The circulating system contains a solution of uranyl sulphate in heavy water at a concentration of 8·6 grams of *uranium* per kilogram of heavy water. In the blanket, a slurry made up in the proportions 1,130 grams of thorium per kilogram of heavy water is circulated. Gas is removed from the fuels in separators, and sent to the recombiner system where heavy water is regenerated, and returned to the high pressure circulating system. In the heat exchangers, steam is formed in a secondary circuit at the comparatively modest conditions of 435° F, 365 lb/sq in. absolute. Provision is made for maintaining the pressure in both core and blanket vessels, and for preventing the pressures in the two vessels from becoming too different.

The core tank is made of an alloy of zirconium. It will be only ½ in. thick, as there is relatively little pressure across it. The core tank has a diameter of about 5 ft. It is central in another vessel 10 ft. in diameter, and this is made of 5 in. thick carbon steel, and holds the main pressure. The carbon steel may be clad with stainless steel, but there is some question as to whether the carbon steel may become enbrittled due to irradiation. Production of a totally stainless steel vessel is impracticable at present, at a reasonable cost.

Most of the pump parts and many of the heat exchanger parts are made of, or clad with, stainless steel, though titanium may be used in the pump and other parts.

The whole reactor and many of its auxiliaries will be housed in a tank 60 ft in diameter and 120 ft high, designed to contain liquids and vapour if a leak should develop.

Reactor power is adjusted by varying fuel concentration. The reactor is started up by gradually charging fuel into the core and blanket systems. At shutdown, fuel from the core will be discharged into dump tanks, from which heavy water will be distilled and returned to the reactor.

There is hope that such a station would generate more U233 than it consumed.

At present, a reactor of this general type is being constructed in a 5 MW heat size. It is hoped to complete it early next year. The size of the core vessels will of course be much smaller—32 in. inside diameter for the zirconium alloy core tank, and a 60 in. inside diameter pressure vessel, built from two hemispheres of 4 in. carbon steel welded together. These hemispheres have a cladding of 0·4 in. thick stainless steel. *(To be concluded.)*

POWER SUPPLY

Statistics for July

THERE is comparatively little to report in last month's commissioning of plant. In fact only one set is recorded from the C.E.A., that being a 30 MW unit made by the General Electric Co., which was put into operation at Huddersfield. This follows on a previous commissioning of a similar set at the beginning of last year, and brings the station capacity up to 100 MW.

Total installed capacity at maximum continuous rating at the end of last month stood at 21,090 MW, of which the North of Scotland H.E.B. contributed 623 and the South of Scotland Electricity Board some 1,251 MW. These figures show a decrease of 6 MW in the North of Scotland and of 1 MW in the South of Scotland compared with the previous month. The corresponding total installed capacity for July 1954 was 19,622 MW; there has thus been an increase of some 7·5%.

Sales of energy, although showing but a small increase over the corresponding month last year as an actual percentage (2·7), when corrected for weather conditions and working days come out as 10·1% thus indicating that the rate of increase of consumption is remaining fairly consistent. This figure of 10·1% is, however, a considerable increase over the two previous months' equivalent figures of 9·6% for May and 9·5% for June.

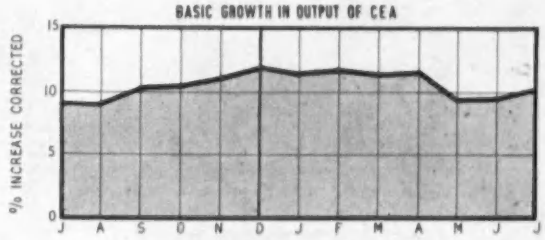
Looking at Area Board progress it can be seen that in absolute figures the London, Midlands and North Western Boards all failed to attain the total sales they had in the previous July. Both Merseyside and North Wales and the East Midlands Boards however showed a significant increase: the former being 6·7% over last year's figures and the latter being 5·2%. Over the twelve-monthly totals, however, the South Western Board is still holding its lead with 16·0% increase in total sales, and is followed by Merseyside and North Wales with 14·4%. As in previous months also, direct sales by the C.E.A. are well up on last year at 39·8%, and although they account for 149 million kWh they are of course a small fraction of the total, accounting for only 3·5%.

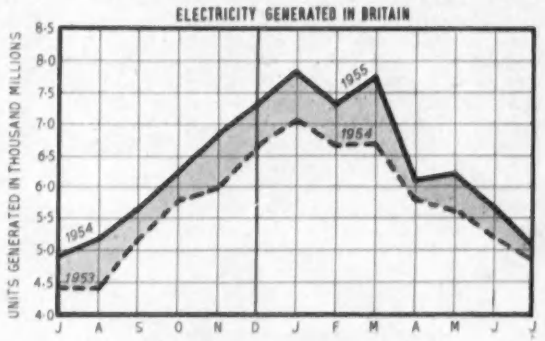
In considering the actual sales figures of July of this year compared with the same period last year, it should be remembered that the ambient temperature has on the average been about 5·5° F higher than in July, 1954.

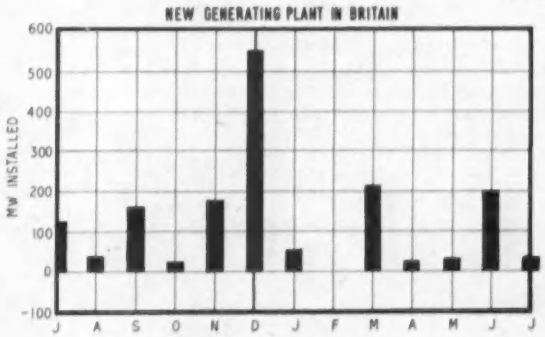
ELECTRICITY BOARD AND C.E.A. SALES IN JULY

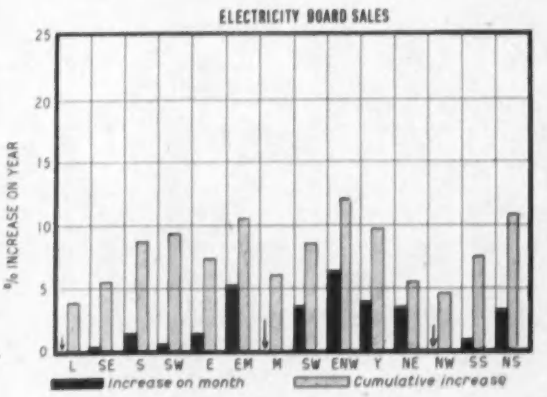
Area Board	July total in million units	%age inc. on July 1954
London	375·4	—0·2
South Eastern	244·0	0·3
Southern	295·2	1·8
South Western	164·1	0·9
Eastern	399·4	2·3
East Midlands	361·8	5·1
Midlands	454·3	—2·8
South Wales	307·1	3·2
Merseyside and North Wales ...	294·8	6·7
Yorkshire	475·4	3·9
North Eastern	290·0	3·5
North Western	498·9	—1·0
Direct Sales by C.E.A.	149·0	39·8
C.E.A. Total	4,309·4	2·7
South of Scotland	299·6	1·1
North of Scotland	71·1	2·8

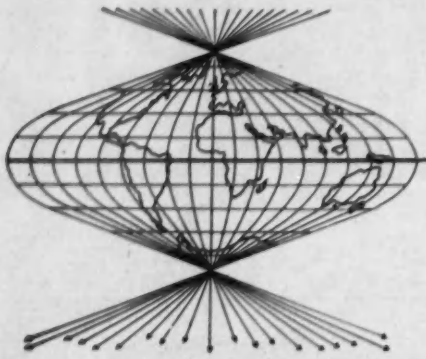
Electricity coal stocks at the week ended 6th August, amounted to 5,287 thousand tons—5·1 weeks at current usage. This compares with 5,371 thousand tons at the 7th August, 1954—a figure representing over 5¼ weeks' consumption. Gas coal stocks are also slightly down being 2,448 thousand tons as compared with 2,513 thousand tons in the previous year. The most encouraging sign is the increase in stocks of opencast coal from 144 thousand tons to 434 thousand tons, again due largely to the drier weather this summer.











OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

St. John's Smoke Nuisance

The problem of smoke emissions is not confined to the U.K. The smoke nuisance at New Brunswick Electric Power Commission's Dock St power station at St. John, will be greatly reduced if not eliminated as a result of a water spray system being installed there. The experiment, believed to be the first of its kind in Canada, was announced by the Commission's chairman, Hon. Edgar Fournier, and follows his visit to the U.S. where he found the system in wide and effective use in New York, Philadelphia, Boston and other large cities. The spray system is being installed by A. P. Green Co., who are placing coil pipes with pointed nozzles inside the chimney and 15 ft from the bottom. The dampened soot will fall into a receptacle beneath. The chimney is being lined with a special acid and abrasive resistant lining to prevent harm to the brick caused by created acids.

Effect of C.S.A. on Imports

The House of Commons in Ottawa have been discussing the effect of Canada's demand that imported electrical goods should comply with minimum requirements of their Standards Association. The question before them was whether the demand restricted imports too much, too little or not at all. Mr R. R. Knight of Saskatoon said it restricted imports too much giving West Germany's opinion that they could sell goods in Europe of the Commonwealth but could not get permission, except over a long period, to sell in Canada. Mr J. B. Hamilton of York West said C.S.A. approval restricted imports too little. A large part of Canada's electrical industry, he maintained, were complaining that goods were being imported which did not meet C.S.A. requirements. He showed two lamps, one made in the U.S., and one to C.S.A. standards. The socket in the Canadian maker's lamp cost 6½ cents more, the cord 3½ cents more and the label one cent.

Mr C. D. Howe, Minister of Trade and Commerce asserted that the correct answer was "not at all." The C.S.A. did not restrict imports at all; anyone could ship in electrical goods and, if he was lucky, sell them. The only man who will stop unapproved goods being sold was a provincial inspector. He was informed that all provinces had laws making it illegal to sell unapproved electrical apparatus. No one denies, Mr Howe continued, that some importers got away with a lot of unapproved goods in retail stores, and most of it came from the U.S. A representative of one overseas firm had said that for anyone to stay in the market, C.S.A. approval was essential. Mr Howe said that informally, the customs department tipped provincial inspection authorities off when large shipments of electrical apparatus came into the country, but then it was up to the provincial authorities.

Prince George's Increased Output

The British Columbia Power Commission is to boost the output capacity of Prince George's power utility 1,000 kW by the installation of a new Cooper-Bessemer generating unit. Mid-Nov. is the target date for completing the installation. Addition of the new unit will bring the total emergency output of the power utility to 7,174 kW. Maximum sustained output with the former army power plant and one obsolescent unit in the First Avenue plant held in reserve would be 6,224 kW. Estimated peak output for next winter will be about 4,000 kW.

$1m Plant at Kindersley

A new $1m electric generating plant at Kindersley is to be built by the Saskatchewan Power Corporation. It is to be equipped with two 3,000 kW Cooper-Bessemer gas engine generating units. Situated just half a mile outside Kindersley, the station is being designed for easy expansion and accommodation will be provided for a third unit. It will supply power to the Corporation's extensive northern integrated transmission system.

The Corporation is also starting work on the structural steel erection at the new extension to the A. L. Cole power station. The extension will house a 33,000 kW unit and will cost over $4m.

PHILIPPINES

Nuclear Station

The General Public Utilities Corporation are to investigate the possibility of building a nuclear power plant for the Manila-Electric Co., their subsidiary in the Philippines. This is understood to be the first American nuclear project to be undertaken outside the U.S. The decision, announced by the parent company's president, Mr A. F. Tegen, is based on the fact that fuel costs in the Philippines are almost double those of the company's U.S. subsidiaries. An access permit for classified information relating to nuclear power plants has been received from the Atomic Energy Commission.

JAPAN

Fuel Resources

Investigations have been taking place in Japan into the question of the utilisation of indigenous fuel resources. At the present time the country supplies 81·6% of the total fuel needs, but within the next two years the Government hope that the proportion will be raised to 82·8%. The construction of large scale hydro-electric projects and additional high efficiency thermal power stations are already under way, but as further contributions, the Government is contemplating nationalising the coal industry, and restricting the use of heavy oil, which has to be imported.

SOUTH AMERICA

Chile Geysers

It is reported from Antofagasta that U.S. and Canadian financiers are willing to invest $US500,000 in preliminary studies of the possibility of employing the El Tatio geysers to produce electricity. It is claimed that in the early stages of exploitation the gases could produce 500,000 kW. They are situated in desert regions about 100 miles from Calama. The gas columns reach a height of 15 metres.

AFRICA

Steam up in Kenya

The use of volcanic steam in Kenya's Rift Valley for generating electricity is now being investigated for the East African Power and Lighting Co., by Balfour Beatty and Co. In the next few weeks test boreholes are to be sunk in the Rift Valley but power from steam will only be possible if the latter is found under great pressure and at high temperature. Meanwhile a geological survey has to be completed and the sites chosen. Most of the steam occurs on the west side coming from crevices in the

core of a volcano, and if these yield sufficient steam a pilot plant will be set up to determine the best means of utilising it. The boreholes, incidentally, are to be sunk to a depth of 3,000 ft. Success or failure of the project will be known in about 18 months time. Kenya's steam is volcanic, like that in Southern Italy, where it is being used extensively to generate power.

Electrification Investigation

Officials of the English Electric Co., Ltd., and Metropolitan-Vickers Electrical Co., Ltd., recently arrived at Nairobi to investigate and report on the practicability and cost of introducing either diesel or electric traction on the main railway line between Mombasa and Nakuru.

Power for Machakos

A 10,000 V supply for Machakos (Kenya) has been planned by the E. African Power and Lighting Co., to come into operation by the middle of 1957. The supply will deliver 150 kW to the township from the Athi River. The main distribution line is to follow the Machakos Rd to the outskirts of the town. It is not proposed in the first place to give supplies outside the township but this may be possible later. In Machakos itself some four miles of 10 kV overhead line will be erected and the voltage stepped down to 415 V three-phase and 240 V single-phase systems through seven transformers. Nearly three miles of l.t. lines will be installed. Houses, shops, Government offices and light industry will have a supply.

Time Saved on Kariba

Notices have appeared in the Press announcing the Federation of Rhodesia and Nyasaland's intention of inviting tenders for the main civil engineering work for the Kariba Gorge hydro-electric power project. Replying to a question in Parliament, Sir Malcolm Barrow said the step had been taken to save time because, in the normal course of events, tenders would be invited only after the completion of plans and specifications. These were not expected to be ready until November. Interested contractors are being invited to submit details of their qualifications and experience, and from the names submitted, some would be selected and invited to tender for the work. Besides this country, the Press announcements have appeared in Africa, the U.S., France, W. Germany, Italy, Denmark, Sweden, the Netherlands and Switzerland.

MALAYA

Order for Locos

An order covering 20 main line 1,500 h.p. diesel electric locomotives has been placed with the English Electric Co., Ltd., by the Malayan Railways, through the Crown Agents. The contract is valued at approximately £1¼ million. The locos will haul express trains up to 450 tons in weight, on the Singapore-Kuala Lumpur-Prai line. They weigh 96 tons each and are of the Co-Co type. The Malayan Railways are planning extensive improvements to their main line services. The operating speed at the moment is limited to 45 m.p.h.; with the new locomotives a maximum of 60 m.p.h. will be possible.

S.W. ASIA

Power Targets

Targets have been set by the Damodar Valley Project for the second Five-Year Plan. During these five years a supply of an additional 155,000 kW is planned from power stations at Bokaro, Konar and Panchet dams. This will be in addition to the existing target of 276,000 kW. A sum of Rs100 million has been allocated for this new programme.

Multan Power Station

Multan, in the Punjab, is to be the site of a new power station with a planned installed capacity of 316 MW. Primary purpose of the station will be to meet the needs of Pakistan's first iron and steel pilot plant, now being built in the area. The station is to be run on natural gas from Sui, in Baluchistan, which will be transmitted through a 16 in. pipe line over a distance of some 200 miles.

NORWAY

Rail Electrification

The railway which runs along the south coast of Norway, from Oslo in the east, to Stavanger in the west, will be completely electrified by next year. The last section of the route to be converted to electrified working, from Egersund to Stavanger, is scheduled to be open for traffic next spring.

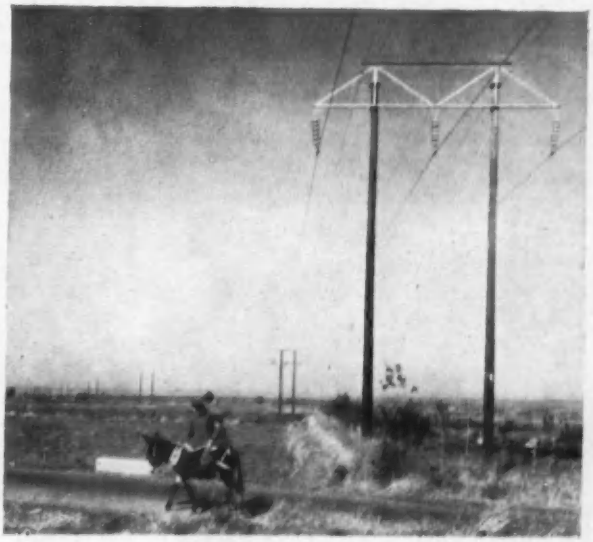
AUSTRALIA

Report on H.E. Development

The Hydro-Electric Commission of Tasmania have engaged Sir Alexander Gibb and Partners, of London, to make a technical report on future plans of the Commission for the development of the hydro-electric resources of Tasmania. Mr J. G. Brown, one of the partners in the firm, visited Tasmania last March to inspect hydro-electric works and for discussions with the Commissioner. Further representatives of the firm are expected to arrive in October. This action of the Commission is in line with the policy it adopted in regard to the proposals for the Lake Echo and Wayatinah power developments. On that occasion a report was obtained from Mr E. Pierson and Prof Charles Jacob, technical consultants nominated by the Schneider Co., of France.

Further Funds

The State Electric Commission of Victoria has floated a further £2 millions loan. The major part of the finance is required for Yallourn and Morwell projects, in addition to works at Kiewa and Eildon.



The first stage of the island-wide electrification scheme embarked upon by the Government of Cyprus has now been completed. This includes the building of the first part of the power station with 28 MW of plant installed, and the erection of 66 kV and 11 kV transmission lines to most of the principal towns and mining and industrial areas. Many British firms were associated with the work, including British Insulated Callender's Construction Co., who were responsible for the supply of materials and equipment, for the construction of the transmission lines and distribution systems and who also installed the power cables in the generating station. Full details of the plant installed in the station, and of the electrification scheme, were given in our 17 Jan., 1952, issue. Construction of the 66 kV lines comprises 7/·161 in. s.c.a. conductors at 13 ft spacing, carried on twin wood poles 44 ft high, except for a 3-mile stretch over War Dept. property near Dhekelia (where steel towers were used to give greater ground clearance), a 23-mile stretch in mountainous country and a short section between Karvounas and Limassol. Our illustration alongside shows the 66 kV line between Nicosa and Astromeritis. Distribution is by 11 kV overhead line. Cypriot workmen were quick to learn the job of erecting o.h. lines under the guidance of B.I.C.C. engineers. The excavation of rock was a slow and tedious job, however, and in regions difficult of access, donkey transport was used. With the first stage of the island's electricity programme completed, work on the second stage is making rapid progress

Personalities

IN THE INDUSTRY

Former manager of the Scottish Area and Leeds Area sales offices of George Ellison Ltd., and associated with them for over 25 years, **Mr H. Copping,** M.I.E.E., in his capacity as President and Managing Director of Electric Construction Co., Canada Ltd., will handle the sales and engineering service in Canada of "Ellison" electric switchgear and "Tufnol" insulating material.

Mr Copping was with Ellison's, at the Leeds office until 1950 and now has his headquarters with the Canadian company at 1947 Avenue Rd, Toronto 12.

Mr P. K. Davis, M.I.E.E., has been appointed Transmission Engineer, Eastern Division, with effect from 1 Oct., 1955. He replaces **Mr A. W. Sweetinburgh,** A.M.I.E.E., A.M.C.T., whose retirement is announced. Mr Sweetinburgh, who has been the Divisional transmission engineer since Oct., 1948, was earlier, second assistant transmission engineer.

Mr Davis, who has been senior assistant transmission engineer, Eastern Division since vesting day, was previously outside department mains superintendent of the Northmet Power Company; construction engineer and mains superintendent, Electricity Board for Northern Ireland and Assistant Engineer, Merz and McLellan. He received his training at Hereford Cathedral School and Faraday House.

Mr F. J. Hutchings has joined the cable division of Connollys (Blackley) Ltd. as their representative in the Midlands Area after 30 years in the wholesale trade.

Mr W. Plumb has been appointed deputy commercial manager for the Liverpool and Netherton works of the English Electric Company Ltd. For the last six years Mr Plumb has been manager of the Leeds branch office of the company and he is succeeded by **Mr A. J. Evans.** Mr Evans is a former E.E. student apprentice who received his early experience at the company's Stafford works, and until the last war was attached to the Bristol, Manchester and Southampton branch office. On returning from military service he was placed in charge of the Tonbridge office and before his new appointment was at the English Electric London Branch.

New appointment to the sales staff of their Northern branch at 40 Longley Lane, Northenden, Manchester, is announced by Simplex Electric Ltd. **Mr H. Savory,** who was previously with Thorn Electrical Industries, is well known in Northern electrical trade circles and in his appointment to Simplex Manchester office he will cover six Northern counties.

District engineer at Aberdare with the South Wales Electricity Board, **Mr Ivor Davies,** B.SC., A.M.I.E.E., has now been appointed district engineer for the Liverpool South district of the Merseyside and North Wales Electricity Board and takes up his duties next Thursday, 1 Sept.

Mr Davies received his technical training at the University College of Cardiff and gained early experience as a junior scientific officer at T.R.E. Malvern and with the Wessex Electricity Company. He took up his appointments with the Southern Electricity Board at Slough and Salisbury. For three years prior to going to Wales Mr Davies was an assistant planning engineer with No. 4 Sub Area of the Mersey and North Wales Board.

For the past six years chief engineer, Switchgear Division of the Brush Electrical Engineering Co., Ltd., **Mr V. W. Lowe,** B.ENG., M.I.E.E., has been appointed chief engineer of Erskine, Heap and Co., Ltd. Mr Lowe, who was educated at Liverpool Collegiate School and the University of Liverpool, served his apprenticeship with Ferguson, Pailin Ltd., after which he was in their Research Department. He then became senior electrical engineer at the Huddersfield Works of the I.C.I. Dyestuffs Division prior to going to the Brush Co. in 1949.

Deputy station superintendent at Bankside power station, London Division, C.E.A., since June 1954, **Mr G. Nicholson,** A.M.I.MECH.E., A.M.I.E.E., A.M.I.I.A., A.M.S.E., has been appointed to a similar post at Castle Donington power station, East Midlands Division, with effect from 1 Oct. Mr Nicholson thus follows his former station superintendent at Bankside, **Mr H. Topley,** A.M.I.E.E., who became station superintendent at Castle Donington on 1 July last (as we reported on 12 May). Prior to going to Bankside, Mr Nicholson was assistant turbine house superintendent at Battersea power station for eighteen months. He entered the Electricity Supply Industry in 1946 after five years in the shipbuilding industry with Harland and Wolff Ltd. Afterwards he served at Fulham power station, ultimately as charge engineer, and at the C.E.A. London Division Group II headquarters, before going to Battersea.

Mr C. S. Gray has joined the board of Charles Colston Ltd.

Mr Peter Grove has resigned his seat on the board of Tube Investments to take up a full-time appointment as joint managing director of Talbot Stead Tube, one of the group's larger subsidiaries.

The new district manager of the Stoke South District of the Midlands Electricity Board, **Mr H. McCartney,** A.M.I.E.E., whose appointment we briefly noted last week, has been senior assistant engineer (planning) in the North Staffordshire subarea of the Board for the past six years. He gained early training with the Stoke-on-Trent undertaking, and after several junior appointments became district mains engineer in charge of the Stoke-on-Trent Northern District, which position he held from 1929 to 1944. From then until vesting day he was technical assistant at the central office of the Stoke-on-Trent undertaking.

Mr H. Copping

Mr P. K. Davis

Mr V. W. Lowe

Mr G. Nicholson

Mr H. McCartney

The Minister of Fuel and Power has appointed the following new members of the Industrial Coal Consumers Council: **Mr E. L. Gethin,** B.SC., A.M.I.E.E., Supplies and Production Adviser, British Transport Commission; **Mr Harry Douglass,** member of the General Council of the T.U.C. and general secretary of the Iron and Steel Trades Confederation; **Mr R. J. Moffat,** M.B.E., Director General of Marketing National Coal Board. Mr Moffat has also been appointed as a member of the Domestic Coal Consumers Council.

Mr Gilbert Dodd, who has been general manager of Monsanto Plastics Ltd. since its formation in December, 1953, has been appointed to the board of directors of the company.

Monsanto Plastics is a wholly owned subsidiary of Monsanto Chemicals, with whose sales division Mr Dodd was associated from 1939 until his appointment in 1949 as manager of the plastics department.

Mr C. G. Derbyshire, B.SC.(ENG.), M.I.R.S.E., has been appointed Assistant Signal Engineer (Modernisation) British Railways (London Midland Region).

Mr Derbyshire began his railway career in 1918 as an apprentice in the Chief Civil Engineer's signals department of the former Great Eastern Railway. In 1922 he was appointed Junior Assistant, Signal Engineer's Department and in 1926 transferred to the Chief Civil Engineer's Construction Office, returning to the signal engineer's department in the same year. In 1936 Mr Derbyshire joined the L.M.S.R. signals department and in 1941 his services were lent to the Ministry of Supply when he became deputy Assistant-Director of Transportation and Equipment. In 1942 he became Assistant Director, Directorate of Royal Engineer Equipment. He returned to the railways in 1943, in 1944 was appointed Assistant (Development and New Works), in 1946 signalling assistant to the L.M.S. Signal and Telegraph Engineer at Watford H.Q. and in 1948 he became Divisional Signal and Telecommunications Engineer, Manchester.

Sharples Centrifuges Ltd. announce the appointment of **Mr G. G. Jackson,** B.SC., as a chemical engineer based on the company's Tower House Laboratories at Stroud. Mr Jackson was formerly with the Atomic Energy Research Establishment at Harwell, and will now be particularly concerned with Sharples' field tests and the Technical Advisory Section's work.

Mr C. M. Nesbitt, sales director of Dorman and Smith Ltd., and D. S. Plugs Ltd., has retired from both companies as from 31 Aug. **Mr D. Kinnell,** the present export manager has been appointed to succeed him as sales manager to both companies.

Sir John Cockcroft has been re-elected president of the European Atomic Energy Society.

Mr Frank Spencer, who has for many years been a director of Opperman Gears Ltd., will shortly be vacating the appointment of managing director of Hotpoint Electrical Appliance Co., although remaining on its Board in a consultative capacity. He will become an executive director of Opperman Gears Ltd., concerned particularly with its future development and widening activities.

The Minister of Fuel and Power has appointed **Mr G. L. Curnow,** F.C.I.S., as chairman of the South Wales Electricity Consultative Council with effect from 1 Oct., in succession to **Mr C. L. Hilton,** M.I.MECH.E., M.I.CHEM.E., who will retire at his own request on completion of his term of office on 30 Sept. next. Mr Curnow has been a member of the Consultative Council since its inception in Dec., 1948, and its deputy chairman from 16 Oct., 1952.

Formerly manager of the Luton branch of Enfield Cables Ltd., **Mr J. F. Parnell** has succeeded **Mr J. Adamson** as manager of that company at Birmingham. Mr Adamson has taken up an appointment at the company's London office. Prior to joining Enfield's Sales Organisation, Mr Parnell was for many years on the engineering staff of the Contracts Department. The new manager of Enfield's Luton branch is **Mr A. B. Chaplin,** who for many years was a senior representative there.

Mr D. J. Bolton, M.SC.(ENG.), M.I.E.E., M.AMER.I.E.E., retires from the Central Electricity Authority at the end of August after 5 years in their Commercial Department. He joined the Authority following 7 years in the Ministry of Fuel where he served in the Fuel Efficiency and Electricity Divisions, and acted as secretary successively of the Fuel Efficiency, Heavy Electric Plant and Clow Committees. Previously he was a lecturer at the Regent St Polytechnic. Educated at Nottingham High School and University College, he is an old Met. Vickers apprentice, and his early experience was gained in the commercial offices of this firm and of the English Electric Co., Ltd. Mr Bolton has been a member of the Council of the Electrical Research Association, a member of the London and Home Counties J.E.A., and of the Measurements Section Committee of the Institution of Electrical Engineers. Over the past 30 years he has contributed ten papers to this Institution dealing with economic and tariff aspects of the industry, the latest of which, "A Criterion of Distribution Cost" gave rise to a lively discussion at the last session. He is also well known for his books and other writings on this subject. He is taking up work as a consultant in association with Messrs. Kennedy and Donkin.

Mr W. H. Smith, O.B.E., chairman and joint managing director of W. H. Smith and Co. (Electrical Engineers) Ltd., sailed last week in the *Queen Mary* for the U.S.A. and Canada. He is reported to have stated that he is going to look into the possibilities of starting up business in Canada, perhaps by acquiring a controlling interest in an existing firm or by a trading arrangement.

Mr Walter Grainger, M.INST.F., and **Mr John Mayer,** B.SC., A.M.I.MECH.E., have been appointed joint managing directors of International Combustion (Holdings) Ltd. as from 22 Aug. Both the new joint managing directors have been with International Combustion Ltd. for over 30 years.

Mr A. H. Emerson, A.M.I.E.E., M.I.LOCO.E., A.F.P.W.I., electrical traction engineer—Manchester electrified lines—has been appointed assistant electrical engineer (modernisation) British Railways (London Midland Region) Derby. In Feb., 1950, Mr Emerson became resident electrical engineer for the Manchester-Sheffield-Wath scheme and has been associated with the erection and commissioning of that electrification project which went into commercial service as a complete scheme in Jan., 1955. During this period, there have been a number of new schemes on the Manchester-Bury and Manchester-South - Junction - Altrincham lines which Mr Emerson has controlled as a district officer. Earlier he worked on the Liverpool St-Shenfield electrification scheme, after being technical assistant in the rolling stock section of the L.N.E.R. electrical engineer's department at King's Cross. He gained early mechanical and electrical engineering training with the former L.N.E.R. at Peterborough.

OBITUARY

Mr H. Gwyn Morgan, manager of the G.E.C. Swansea branch, died last week, aged 61. Mr Morgan joined the Cardiff branch of the company in 1934 after earlier service with a firm of South Wales electrical contractors. In June, 1935, he was transferred to Swansea Branch as manager of the Installation supplies department and assistant to the branch manager to which post he succeeded in 1950.

Mr Harry Simpson, one of the senior sales managers of Hoover Ltd., died on 15 Aug. He had served the company for 32 years. He began his Hoover career as a salesman and was successively promoted through the various ranks in the sales force to branch manager when in 1938 he was made manager of the then West Yorkshire branch with headquarters at Leeds. In 1947 he was made Southern branch manager with headquarters at Brighton, which post he held until a few months ago, when he was transferred to London to an executive post for special administrative duties.

Mr F. H. Crocombe, M.M., M.B.E., district engineer at Minehead to the South Western Electricity Board, died last week aged 63. Born in Lynmouth, he joined the Lynton and Lynmouth Electricity Co. in 1906, and after subsequent experience at Trowbridge and Chippenham power stations, became charge engineer at the Minehead Electric Supply Co.'s power station. In 1937 he was appointed distribution engineer to the Minehead and Wellington Supply companies—a position he held at vesting day. In 1948 he became district engineer for the Board's Minehead district.

Equipment for Industry

Small Motor Speed Controller

A SPEED control unit for use with small d.c. motors has been introduced by PRECISION HEATING LTD., 142a Canbury Park Rd, Kingston-on-Thames, Surrey. The equipment operates from a 230 V 50 c/s supply and performs a similar function to the electronic type controller as it provides d.c. motors with infinitely variable speeds at substantially constant torque. Static metal rectifiers convert the input supply to direct current and speed variation is obtained by applying a variable d.c. voltage to the motor armature with constant field excitation. Speed variations in the region of 30:1 are claimed, but the equipment cannot exercise a fine control over specific speeds and is therefore more suitable where a wide speed variation and not high accuracy is of prime importance. Two types of this controller are available for use with d.c. motors rated either up to ½ h.p. or up to 1 h.p., both models being housed in grey painted metal cabinets suitable for either wall or bench mounting. Both versions of this equipment incorporate an adjustable electro-dynamic brake for arresting the motor and an electric speed indicator which may be calibrated in suitable units. Containing no electronic valves or moving parts, the controller should require little maintenance and be simple to operate due to its few, easily located controls.

The "Precision" speed controller provides a wide speed variation for small d.c. motors

Improved Dry-charged Batteries

THE shelf life of dry-charged car batteries has been claimed to be extended by treating the battery plates with a waterproofing compound making them impervious to atmospheric moisture. This technique which prevents any gradual loss of plate charge has been developed by OLDHAM AND SON LTD., Manchester, who state that a battery treated in this manner will retain its full charge after an almost indefinite period of storage.

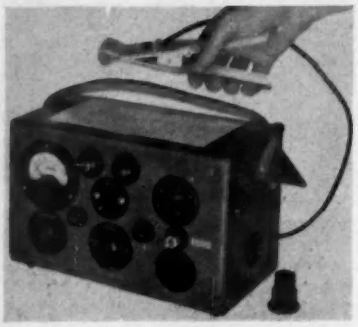
Miniature Micro Switch

TWELVE 5 amp switches comfortably packed in a standard match box. This has been claimed by BURGESS PRODUCTS CO., LTD., Dukes Way, Team Valley, Gateshead, using their new miniature micro switch, the V4, which has dimensions of ¾ in. x ½ in. x ½ in. Robustly constructed and housed in a bakelite case, this single-pole changeover switch with positive snap action has a rating of either 5 amp 230 V a.c. or 2 amp 30 V d.c. and a minimum contact spacing of 0·01 in. Depressing a plunger requiring a maximum pressure of 7 oz operates the make and break switch. Two other models are available for situations where a plunger switching operation is not suitable, the alternative versions have auxiliary actuators with either plain or roller levers.

This clearly illustrates the minute size of the new Burgess micro switch, the V4

Measuring Earth Loop Impedance

READERS may recall our description of the Briticent full load earth tester included in this feature of 14 July last. Recently this unit has been modified by the manufacturers, BRITISH CENTRAL ELECTRICAL CO., LTD., 6-8 Rosebery Ave, E.C.1, to incorporate a facility for measuring earth loop resistance. This addition to the equipment has developed from the need for obtaining a true earth loop resistance measurement to overcome the disadvantages of the partial earth loop test by which faulty conditions existing back to the nearest earthed supply point are not revealed. By the use of a high test current, fault conditions are simulated and thus doubtful earthing conditions revealed. The test equipment, housed in a robust, polished wood cabinet, comprises essentially a double wound transformer and a direct reading ammeter calibrated in ohms.



This new "Briticent" neutral loop impedance tester incorporating the full load earth tester rapidly reveals faulty earthing conditions

Colour Matching Equipment

COLOUR matching within fine limits provides one of the major problems in certain classes of products and manufacturers are constantly seeking suitable comparative equipment. Fluorescent lighting has achieved a certain success in this particular field and has been utilised in a new colour matching unit designed by PHILIPS ELECTRICAL LTD., Shaftesbury Ave, W.C.2. The apparatus consists of several fluorescent lamps housed in a reflector casing which may be mounted either on an inspection bench or suspended from the ceiling by means of four adjustable supports. This equipment is said to provide a constant colour illumination of substantially the same spectral composition as natural daylight from a clear Northern, March sky at noon. Additional features contained by the unit are an automatic lamp burning hours meter and indicator lamps which show that the circuits are functioning correctly.

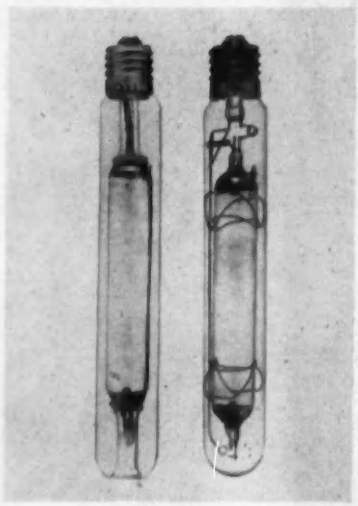
Philips offer this fluorescent lit colour matching unit providing a constant colour illumination

Crompton redesign m.v. Lamps

LATEST mercury vapour discharge lamps introduced by CROMPTON PARKINSON LTD., Crompton Hse., Aldwych, W.C.2, incorporates several new and important features.

The main improvement is evident in the method of mounting the inner glass tube containing the mercury and electrodes. In place of the former complex arrangement of springs and clips is a new system whereby the inner tube is securely held between two sturdily constructed stems integral with the outer glass envelope. Asbestos pads located between the inner tube and the stem afford both a cushioning effect and an allowance for expansion, due to the heat emission. It is further claimed that there is no bulb discoloration due to overheated wirework coming in contact with glass and thus depreciation in light output is reduced. Original internal cleanliness is maintained at least over 4,000 hours usage. In addition this new method of suspension helps avoid glass fractures at local hot spots.

The improved lamps are now available from stock in the popular 250 and 400 W sizes. Prices are as for other E.L.M.A., m.v. discharge lamps.



The improved suspension in Crompton m.v. discharge lamps is shown in comparison with the old method

TRADE PUBLICATIONS

CABLES.—New publications by W. T. Henley's Telegraph Works Co., Ltd., 51-53 Hatton Gdn, E.C.1, are Catalogue C "Paper Cables"; Catalogue R "Rubber Cables" and Booklet 508 "33 kV Solid Type Cables."

DIESEL ENGINES.—Latest publication by Davey Paxman and Co., Ltd., is No. 1455 featuring the Paxman ZH horizontal diesel railcar engine.

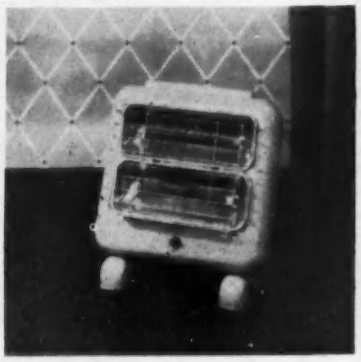
LIGHTING.—W. J. Parry and Co. (Nottingham) Ltd. have issued a new catalogue describing the "Parman" range of auxiliary gear for the operation of electric discharge lamps.

Colour Coded Cartons

NEW system of colour coding to assist dealers in simplifying stocking has been introduced by SIEMENS ELECTRIC LAMPS AND SUPPLIES LTD., 38-39 Upper Thames St, E.C.4.

The outer cartons of all fluorescent tubes sold by the company are now in five overall colours to indicate readily the powder colour of the lamp.

Red indicates natural, light blue—"new warm white," buff—colour matching white; green de luxe—warm white and deep blue—daylight.



The Premier "Jewel" in 2 kW form

Premier 2kW "Jewel" for HomeTrade

NEW 2 kW version of the popular "Jewel" electric fire is being released by PREMIER ELECTRIC HEATERS Division of Hotpoint E.A. Co., Ltd., Keeley St, Birmingham 9.

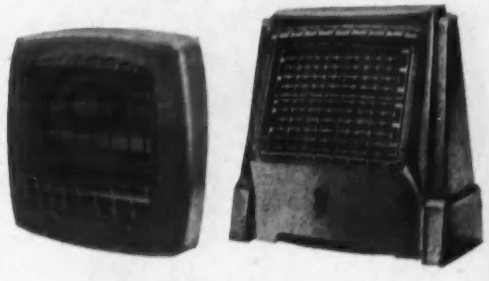
Following closely the design of the smaller model, the new "Jewel" version has elements positioned in highly polished trough reflectors. A switch is provided for selection of one or both elements.

Conforming in all details with British Standard Specifications, the fire is available in Cream (5520) or Green (5521) at a list price of £4. 10s. plus £1. 12s. 11d. p. tax.

New Season's Revo Fires

FIVE selected designs all available in one and two kW sizes, comprise the range of electric fires which REVO ELECTRIC CO., LTD., Tipton, Staffs, are offering for the 1955/6 season. This range comprises "Outset" and "Inset" models in grey, green or beige with either Solaray (pencil type) or Challenge (block type) fire bars. The "Tubular" in chrome frame and reflector and wide adjustable flex has pencil elements. For wall mounting Revo are offering the "Reflexam" in silver finish with chrome reflector, whilst the "Dolphin" model is a bar element cast iron model. Keynote of which is stability. Full details of the range are to be found in the Company's advertisement on page 44 of this issue.

The Outset and Dolphin fires included in the Revo range



For the Electrical Trade

"Prestcold" Sales Aid

A NOVEL sales aid for the "Prestcold" refrigerator Model S.313, now available from the PRESSED STEEL CO., LTD., Cowley, Oxford, comprises a folder which not only contains useful information about this table top model but opens out to the actual height and width of the unit. It is particularly useful for the potential customer since it also indicates the actual floor area taken up by the S.313, and as it folds up to handbag size, can readily be taken home for trying out in the kitchen. The plan further indicates the quantity of food which can be stored.

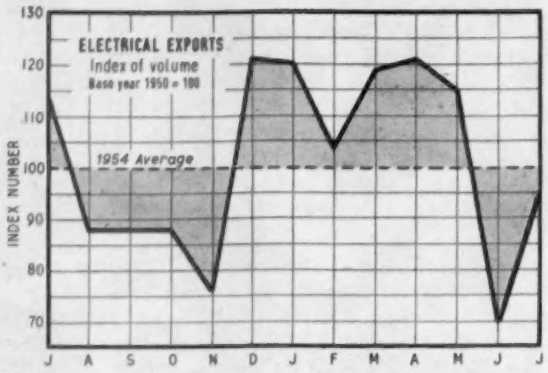
New Ray-O-Vac Batteries

NEW twin cell cycle lamp battery introduced by ALPHA ACCESSORIES LTD., in their "Ray-o-Vac" range of leakproof metal cased batteries provided the Metal Box Co. with a tough problem.

When the company decided that they wanted a decorated metal encased battery of the traditional shape containing two coupled cells, the reaction in many quarters was that it couldn't be done. However, Metal Box designers worked with Ray-o-Vac battery technicians and eventually found the solution to producing a kidney-shaped metal container. Rigidity is ensured by a special side seam construction. The plate is printed externally in four colours and treated internally with corrosion resistant lacquer. Insulation of the metal case has been achieved by the use of self-adhesive tape fixed to the grooved portion of the body casing in conjunction with a board insulator trapped in the base of the battery.

EXPORTS and IMPORTS

Statistics for July



BY the end of last month, the steeply falling curve in electrical exports showed a welcome return to more normal conditions. Much of the drop was, of course, due to the catastrophic railway strike which has had a severe following effect in shipping and movement of heavy capital goods. The index at 94, however, still stands comparatively low, and when future figures for August and September become available with their normal decrease due to holidays the situation may again show signs of deterioration. The low level of 70 recorded at the end of the previous month is, incidentally, the worst yet reached due to labour troubles.

In value, the electrical exports on which the index is based amounted to £13,151,403, although these comprise only the machinery, goods and appliances shown in Class D, Division 16, of the official accounts. This section includes the greater majority of electrical exports but excludes domestic refrigerators and washing machines whose July export value, when added gives a grand total for all exports of £13,962,889.

Many items of heavy plant have not recovered to their former export rates, noticeably electric motors up to 250 h.p. and switch and control gear. Exports of radio equipment also, although nearly £200,000 in value above the total in June, were nearly £500,000 below the figure for July 1954. Of the electric cooking and heating appliances exported last month, cookers alone amounted to £70,171 (still much lower than a year ago) and toasters £28,092, while the figure for flat irons was £85,449. Floor polishers contributed a further £111,786, food mixers £49,033, and hairclippers and dry shavers £39,027.

Description	Exports value (£)			Imports value (£)	
	July 1953	July 1954	July 1955	July 1954	July 1955
Generating Sets:					
Diesel up to 200 kW	279,604	401,326	277,445		
„ over 200 kW	320,305	492,019	190,561		
i.c. driven	20,682	15,981	4,591		
Steam turbine-driven	230,739	123,022	32,222	221,002	91,379
with other prime movers	37,448	63,088	121,321		
Generators	213,497	107,160	197,783		
„ parts	406,039	274,030	220,938		
Motors	739,589	939,138	793,459	28,626	42,721
Motor starters and controllers	280,245	177,353	139,195		
Convertors and rectifiers	88,192	109,959	73,951		
Transformers	1,099,612	1,280,509	539,558	46,561	109,375
Switchgear and Switchboards	1,642,566	1,481,256	987,350		
Batteries, primary and parts	235,216	327,175	269,159		
Fluorescent and Discharge lamps	45,064	64,995	63,116		
Other lamps	100,243	156,487	113,804		
Radio and Electronic gear	1,892,400	2,519,988	2,041,635	695,705	1,280,451
Telephone and Telegraph Plant	1,486,585	1,313,018	1,093,572		
Cooking Appliances and parts	115,062	279,286	168,711		
Space heaters	15,536	30,104	27,754		
Water heaters	20,523	26,326	26,282		
Other heaters and parts	124,946	131,246	200,973		
Welding machinery	80,368	79,050	78,548	32,070	15,945
Signalling and Bell equipment	77,093	35,618	39,380		
Commercial Instruments	146,595	169,660	143,411	84,927	102,019
House Service Meters	98,193	129,630	112,430		
Electro-medical and X-ray apparatus	125,695	116,411	121,167	64,792	77,648
Fans	106,614	105,144	60,073		
Vacuum Cleaners	165,844	200,976	169,154		
Other Appliances and parts	250,144	411,338	311,646		
Portable power tools	130,874	187,389	192,457		
Washing Machines up to 150 lb	241,944	243,101	251,628		
Power Refrigerators, up to 12 cu ft	709,185	846,348	559,858		
Telephone and Telegraph Cables	1,081,337	491,476	438,757		
Paper-insulated Cables	1,221,713	482,117	776,972		
Rubber-insulated Cables	493,616	456,651	386,584	14,024	17,592
Winding and similar wires	148,918	118,243	119,715		
Other Cables and Wires	308,042	272,611	257,479		
Accumulators and parts	241,354	381,085	340,366		
Insulating Materials	120,584	136,659	138,668		
Electrical Ware	86,675	93,515	83,691		
All other articles	1,441,379	1,688,337	1,779,525	459,873	504,737
Total	16,715,260	16,958,905	13,962,889	1,647,580	2,241,867

PROBLEMS AND PRACTICE

In Engineering

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Earthing Street Lamps

I READ with great interest in "Problems and Practice" in engineering, 11 Aug. issue, Mr G. W. Clegg's contribution. "Rude Awakening" is appropriately named. I feel that this presents a "shocking" state of affairs and it is again the public in general that is at the "receiving end." If this state of affairs is allowed to continue, I cannot see that the building of crematoria is a necessity. However, this is an urban district and the electrical installation of the lighting standards may have been done by a local or private contractor. There is no doubt in my mind as to the inefficient manner in which the installation (electrical) was carried out, particularly as far as I can gather, the supply would be by underground cable, leaving the "earthing" of the switch-gear and standards a very easy and simple matter. I feel, in view of the circumstances prevailing in this instance, the examination and inspection of a system of this nature (especially) should take place during the various stages of erection and installation.—*J. H. R.*

Earth-Neutral Shorts

A SMALL fire was started which could have ended very seriously in a company's laboratory recently. The fire started at two 5-amp switched-sockets which were both in the off position and also correctly wired, being switched in the live side.

Investigating further we found that one of the 2 in. wood screws fastening the blocks back to the wall had pierced both the N. and earth wires. All the neutral connections back to the main distribution board were then checked and found to be good.

Unknown to us until the next day, a fault had occurred about ½ mile away on a pole service. The conduit had come into contact with the bottom phase and had burned or blown itself out.

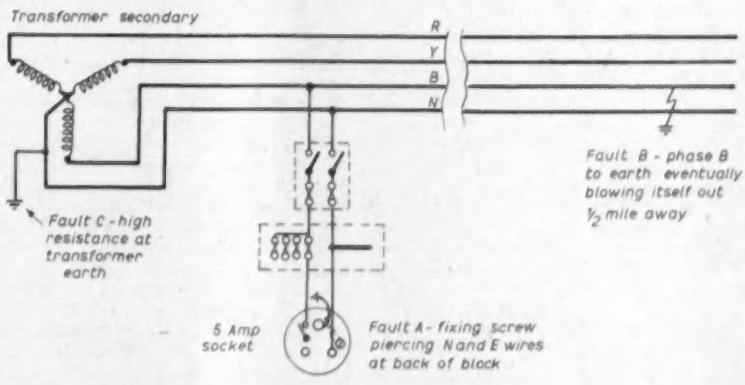
The next thing to check was the earthed neutral at the transformer, which was found to be of a high resistance; therefore the problem solved itself. Bad installation of sockets—and most important thing of all, poor earthing, proved once again that constant checks must never be skipped.

As you will see in the diagram quite a considerable amount of fault (B) current flowed, due to high transformer earth resistance, to the Neutral via the fixing screw. The socket feeds were naturally insufficient to carry the fault current, but held it just long enough to ensure the fire.—*S. F.*

Juxtaposition of Thermal Trips

A PROBLEM which I had recently to solve concerned two 3-phase motors which operated pumping plant.

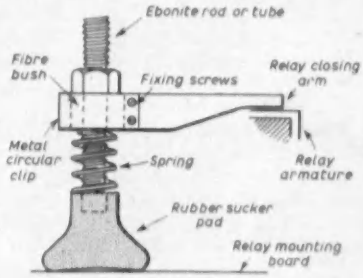
Both the motors were controlled by float switches and automatic contactor type starters, the various steps in the rotor resistance being cut out by thermal delay relays, and both starters were housed in the same panel. On this particular occasion, it was found that one pump was running on reduced speed, the second (standby) pump was not running and the sump was overflowing. Examination showed that the standby machine was out of action due to operation of the thermal trip. In the other machine an open circuit in the thermal delay time relay had caused the machine to continue running with all its rotor resistance in circuit. This resistance bank which was situated behind the starting panel just below the thermal overload trip for the second motor was dissipating enough heat to operate it. —*P. J. G.*


Transformer secondary
R
Y
B
N
Fault B - phase B to earth eventually blowing itself out ½ mile away
Fault C - high resistance at transformer earth
5 Amp socket
Fault A - fixing screw piercing N and E wires at back of block

This circuit illustrates the situation described in "Earth-Neutral Shorts"

Test-closing of Relays

IN SEQUENCE controlled plant it is sometimes desirous to break the sequence for testing, etc. Where the interlocking is carried out by means of small relays these have to be closed, if no provision is made for switching out the relay contacts. Jamming the relays "in" is usually damaging to the contacts and their settings.



Tool for relay locking

The drawing above is of a device to achieve this without damage, minimise delay and ensure good contact on the contact faces.—*R. T. C.*

Motor Endshield Fracture

AFTER some years of satisfactory service a crane motor, driving by pinion to a spur wheel, was removed for routine overhaul.

On dismantling nothing seriously amiss was found although when the motor was re-installed immediate difficulty was experienced, the motor tending to "stall" at starting.

Tests indicated that the windings and control gear were satisfactory although a knock was now noticed coming from the motor. The motor was once more removed from the crane for further examination when it was found that the endshield spigot at the opposite to driving end had not been properly engaged and in fact a portion of the spigot was actually broken off.

The spigot fracture was new and had evidently been broken when the motor was re-erected after overhaul.

The endshield spigot located internal on four stator pads and the spigot being broken allowed the endshields and rotor to move sufficiently to permit the rotor core rubbing on the stator core.

A new endshield was fitted and the motor once more operated normally.—*"Torque."*

NEWS OF THE WEEK

Calder Hall Exhibit to go to U.S.

No Decision Yet on bringing Geneva Display to England

AMONG the rumours which went the rounds in Geneva during the Conference on the Peaceful Uses of Atomic Energy were those concerned with the exhibits of the U.K. Atomic Energy Authority. Contrary to popular belief that the whole of the Authority's displays were to be sent to Washington immediately, we understand that only those items relating to Calder Hall power station will cross the Atlantic. It will be recalled that Sir Frank Markham suggested in the House of Commons early last month that an exhibition of nuclear energy in its industrial applications comparable to that in Geneva should be arranged in this country. He was told that the suggestion was being considered. Apart from America's request for the display, it is reported that similar requests have been received from India, Japan, France, Italy and Sweden. No decision has yet been reached as to whether the Geneva display of the A.E.A. will be exhibited in this country, but our claims are likely to be considered before those of other nations.

Meanwhile, delegates from about 70 countries arrived in this country yesterday at the A.E.A.'s invitation, to visit the Research Establishment at Harwell. The party included about 30 from the Soviet Union and her associate countries. Delegates returned the same day.

COPPER HITS NEW PEAK

COPPER reached a new peak when prices soared to £376 a ton on Thursday last week. This was a rise of £6 on the previous day. As we went to press this week, the price had risen again to £378 per ton. The increase in price on the Metal Exchange was a direct result of a similar increase—by 4 cents to 40 cents per lb—in the U.S. The latter follows not only the recent wage increase but also the Copper Institute's report that July refined copper production was 51,182 tons with stocks at the end of the month of 36,293 tons. This is less than a third of the monthly deliveries in the past four months in the U.S. Even if demand in the second half of this year slackens, supplies may be tight for a little while.

Chain of Office

AFTER 30 years of continuing progress, the President of the Electrical Trades' Commercial Travellers' Association, is to be provided with a "collar and jewel" for use on special occasions. It will be passed on annually to each incoming President for his year of office. The investiture will take place at the general meeting on 9 Sept., at The Feathers Hotel, Westminster. The first recipient will be Mr A. T. Haywood, the first provincial president of the Association.

British Group form New Australian Company

A NEW company has been formed in Australia by Lancashire Dynamo Holdings, it is announced. The decision follows some 30 years of representation of the British Group in the Commonwealth by Coates and Co. Pty. Ltd. The new organisation will be known as Lancashire Dynamo Coates Pty. Ltd. Some of the company's products, notably rectifiers and associated transformers are now being made in Australia. Head office of the Australian firm will be in Melbourne, and a branch office is being established to cover N.S.W. Representation in Queensland will be carried out by Coates and Co., and in Western Australia, Harris Scarfe and Sandovers Ltd., will continue to represent companies in this country, and act as agents for the newly formed company in connection with Australian-made equipment.

CABLE MAKERS' PAY—AMENDMENTS . . .

TWO adjustments have been made to the agreement on rates of pay and working conditions of plumber jointers and mates, by the Joint Industrial Council for the Cable Making Industry. The amount of out allowance has been raised from 7s. to 9s. a day, and free rail travel is to be available six times a year instead of five. These amendments take effect from the first pay period following 14 Aug.

. . . AND HOLIDAYS

IN view of the fact that Christmas Day this year falls on a Sunday, the Joint Industrial Council for the Electrical Cable Making Industry recommends that wherever possible, the following Tuesday should be selected as the substituted day in accordance with Clause 2(a) of the agreement on payment for statutory holidays. In 1949, when Christmas last fell on a Sunday, the Tuesday was made a public holiday by Royal Proclamation. Payment for work done in the holidays will be as previously decided, namely double rates for the day substituted for Christmas Day and for Christmas Day itself, and in accordance with Clauses 9, 10 and 11 of the J.I.C. General Agreement for Boxing Day.

I.T.A. Coverage from Lichfield Station

AREAS to be covered by the Independent Television Authority's service from Lichfield were explained last week. The station is scheduled to come into operation in January or February next year. Coverage will extend to all districts within 30 miles of Lichfield, although in the north and west the radius will extend to about 35 miles and in the south to as much as 50 miles. An entirely satisfactory reception should therefore be provided for Wellington (Salop), Stone (Staffs), Nottingham, Leicester, Market Harborough, Evesham and Kidderminster. In addition, districts on the outskirts of this area should also receive a satisfactory service although in some local areas reception may be poor. Bearing this in mind, such towns as Shrewsbury, Chesterfield, Grantham and Cheltenham should also benefit. Work began on the site at Lichfield last month.

Purchasing Officers to confer at Cliftonville

PROGRAMME for this year's conference of the Purchasing Officers Association, to be held at Cliftonville between 29 Sept. and 1 Oct., has been published. The business sessions include a number of papers to be delivered by members of the electrical industry. Three sectional meetings on new materials cover Silicones, Terylene and Titanium, the first will be explained by Mr K. A. M. Barton, sales director of Midland Silicones Ltd., the second by Mr C. L. B. Carter of I.C.I., and Titanium by Mr J. T. Richmond of Laporte Titanium Ltd. The Swinbank Lecture on Person in Purchasing is to be given by Mr T. E. Turner, chief purchasing agent of the English Electric Co., and Mr J. B. Scott, sales director of Crompton Parkinson Ltd., will be a prominent personality in the discussion on East-West Trade. Dr A. King, chief scientific officer of D. S. I. R., will speak on Science and the Changing Pattern of Industry.

As usual there will be a number of social and sporting occasions, and the prominent and popular feature of these conferences, the Minibition. Entertainment has also been provided for the ladies.

New Facilities for Overseas Visitors at 1956 Electrical Engineers Exhibition

SOCIAL EVENING AND DANCE BEING ARRANGED

ARRANGEMENTS are now almost complete for the fifth Electrical Engineers Exhibition due to be held at Earls Court next year between 20 and 24 March. Despite the advent of the "rival" electrical display at the B.I.F., this exhibition will again be the largest electrical show to be held in this country. Area covered will exceed 250,000 sq ft, over 30 stands will be over 1,000 sq ft in area, and some will be even greater. Most of the established features of the show will be repeated, but innovations include a social evening and dance to take place on the Thursday at London's Seymour Hall, and increased facilities for overseas visitors. The latter is particularly significant in view of opinions that the Electrical Engineers Exhibition was not a show to boost exports and sales overseas. In conjunction with Cook Wagons/Lits Ltd., a service is being offered whereby, at any of their world branches, travel facilities, accommodation, visits to power stations, factories and laboratories, as well as participation in social activities, can all be arranged. Over 500,000 invitations are being sent out to engineers, architects, manufacturers and export concerns, and to members of B.E.A.M.A., Chambers of Commerce, trade, and Embassy organisations.

Apart from the A.S.E.E. themselves, all the principal associations are adding their support including the E.R.A., E.D.A., C.M.A., E.I.B.A., E.W.F., and E.A.W. We note, too, that the British Standards Institution will be exhibiting for the first time. Two silver plaques will again be awarded for the most outstanding industrial and domestic equipment exhibited. The exhibition will be open daily from 10 a.m. to 7 p.m., except on the Wednesday when it will not close until 9 p.m. Tickets available from the General Manager at 23 Bloomsbury Sq, London, W.C.1.

Research into Gas Turbine to burn Peat

A TWO-YEAR research programme into the development of a gas turbine designed to burn peat is to be started this autumn at the Wolverhampton and Staffordshire Technical College. It will cost about £10,000, and is being financed by the Ministry of Fuel and Power. Mr C. L. Old, Principal of the College, has stated they had been asked to carry out the research by a Lincoln firm (presumably Ruston and Hornsby) because of their reputation for work on industrial gas problems. Present difficulty is that the turbine blades become "gummed up" by the ash of the burnt peat. It was hoped to solve the problem in the initial time of two years.

NEW EXHIBITS AT SCIENCE MUSEUM

A SMALL group of exhibits relating to linear electron-accelerators has just been completed by the Science Museum (S. Kensington) in the Atomic Physics Collection. The display comprises sectioned parts of an actual accelerator, presented by Mullard Ltd., an ingenious mechanical model illustrating the principle of the travelling wave accelerator lent by Metropolitan-Vickers, several diagrams showing the construction and operation of accelerators, and photographs showing them in use. Other exhibits on view are a betatron presented by the Clarendon Laboratory, a model of the Philips cascade generator at the Cavendish Laboratory, and a mechanical model illustrating its principle lent by Westinghouse Brake and Signal Co.

Another Electrical Show planned in Uganda

A SECOND Radio and Electrical Exhibition is to be held in Kampala early next year. This decision has been taken by the Uganda Radio and Electrical Traders' Association following the outstanding success of the first exhibition held last January. 20,000 people are said to have visited that show. The Association's chairman would like to see a permanent exhibition centre built in Kampala and small scale exhibitions continually touring the country.

OFFICIAL PUBLICATIONS

E.R.A. REPORTS.

F/T181: Methods of Determining Thermal Resistivity of Soil in situ for Calculation of Cable Ratings, 15s. 4d.; G/T292: Flameproof Electrical Apparatus, Flange-Gap Protection with Fifth Series of Industrial Atmospheres, compiled by A. P. Paton, 7s. 9d.; L/T284: Self-Energy of Electrons in Lattice Fields, by M. Gurari, 9s. 3d.; L/T312: Electrons in Polar Materials, by M. J. Buckingham, 6s. 3d.; L/T315: Dielectric Properties of Methyl Methacrylate Resins, by E. Rushton, 9s. 3d.

NAT. COAL BOARD. Quarterly Statistical Statement for Jan.-Mar. 1955. Available from N.C.B., 5d. (6d. by post).

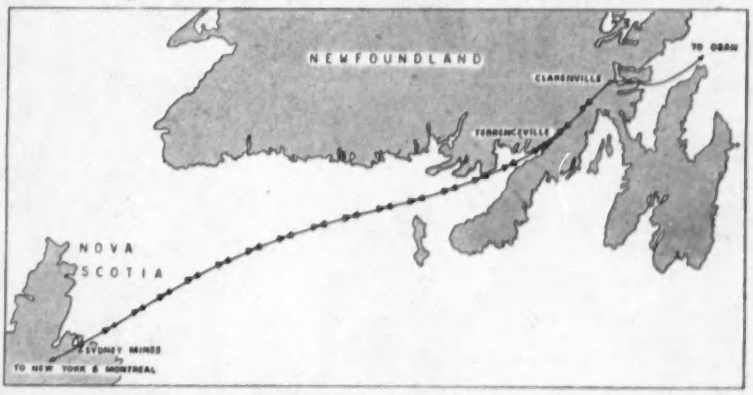
STRATEGIC GOODS (CONTROL) (AMENDMENT) ORDER 1955, S.I. No. 1280. H.M.S.O. 3d.

MINES. Report of H.M. Principal Elect. Inspector for 1952. H.M.S.O. 2s.

U.K. Displays at Strasbourg

FOLLOWING a special appeal by the organisers, there will now be a total of 72 British firms exhibiting at the European Fair at Strasbourg between 3 and 18 Sept. At the beginning of the month only 50 of the 5,000 manufacturers who had booked space were from Britain. In the U.K. contingent there is a sprinkling of electrical firms, notably Thorn Electrical Industries and the General Electric Co. Others in the industry include Cimex Fraser Tuson, Crypto, Gardiner and Gulland and Smiths English Clocks.

Submerged Repeaters on Transatlantic Phone Route



The map reproduced above illustrates the submerged repeaters to be used on the Transatlantic Telephone route between Nova Scotia and Clarenville in Newfoundland. Provision of repeaters for this section of the cable was entrusted to Standard Telephones and Cables Ltd. The section is about 330 miles long and employs a single coaxial submarine cable as compared with the two cables, each of which serves one direction of transmission over the major part of the route. In addition to the 36 transatlantic telephone circuits, this section will also carry 24 telephone channels catering for traffic between Newfoundland and the mainland. Of the 17 two-way submerged repeaters being provided, two will be located in the cable on the short overland crossing in Newfoundland, and the remainder in varying depths of water between Terrenceville and Sydney Mines. The two-way submerged repeaters developed by the company are contained in a torpedo-shaped housing with special glands at each end for coaxial cable connections. It can withstand full cable tension during laying, and consequently can be paid out on to the sea bed as a part of the cable itself. Provision of submerged repeaters for this section by S.T.C. includes power feeding, cable terminating and frequency translating equipment at both terminals

SOUTHERN AND S. WALES BOARDS' TARIFF INCREASES

ELECTRICITY charges in the Southern Board's area are to go up as from the end of next month. The increases will affect all consumers who are not subject to an automatic variation of tariff with variation in the price of coal. The primary unit rates of the standard domestic, farming and horticultural and commercial block tariffs will be increased from 5½d. to 6d. per unit. In the case of prepayment supplies under the domestic tariff, the increase will be from 6½d. to 7d. a unit. The secondary rate of 1d. per unit will remain unaltered. Unit rate of all other tariffs not subject to a coal clause will be raised by 1/10d.

The rise in charges is of course, the immediate result of the 18% increase in coal prices. Explaining the decision, the Board said the additional cost to them would be about £800,000 a year. Hitherto, coal prices, increased working costs, salaries and wages and other commitments have meant an extra burden of £1m. p.a. which the Board have been able to carry, but the recent increase could not be absorbed and the new charges were inevitable.

Proposals for increasing tariffs in S. Wales have been formulated by the Area Board and approved by the Consultative Council. Coal prices as well as national increases in wages and salaries are given as the reasons. The revised rates become effective as from the first meter reading after 30 Sept. In the domestic tariff and commercial block rate tariff, the primary rate is to go up from 5d. to 5½d. a unit, and the follow-on-rate from 0·85d. to 1d. a unit. Primary and final rates in the farm tariff go up similarly, and the intermediate rate from 2½d. to 2¾d. a unit. Rate for the first 1,000 units a month in the industrial block rate tariff is to be increased from 2d. to 2½d. a unit, for the next 5,000 units from 1¾d. to 2d. a unit; and in excess of 5,000 from 0·85d. to 1d. per unit. As with the other Boards no change has been made in the maximum demand industrial and commercial tariffs as these include coal price adjustment clauses.

Factory rises on Hainault Industrial Estate

CONSIDERABLE progress has been made by Tubela Engineering Co. Ltd., on their new factory at Hainault, and some departments have already moved in. The new premises occupies a site of about 12,000 sq ft and there is plenty of room for expansion if the future demands it. All the working area will be on the same floor at ground level, and office accommodation will be on the first floor. The latter will not be ready for at least a month, so that the old address of 6 Furze St, London, E.3, remains for the present. The necessity for acquiring the larger site and building a bigger works has been caused by continued progress over the last decade. Increased production to meet rising demand will result. The company will continue to make their range of Tubela bending machines including new models, and it is proposed to branch out into other fields of engineering in due course.

P.S. from Douglas

THE Electricity Committee of Douglas, Isle of Man, has reported that the recent increase of 9s. 3d. a ton in the price of coal, and rise in freight charges, will add another £10,000 to their annual bills. In spite of this, it is not intended to increase tariffs. The Electrical Engineer stated that tariffs would remain the same in anticipation of a further development in the use of electricity. The use of oil fuel had been under consideration for some time.

ATOMIC ENERGY AGENCY

IN our issue of August 11 we reviewed a booklet giving details of work being undertaken in Commonwealth Countries in connection with nuclear energy, and mentioned that it included an appendix giving Soviet proposals for an International Atomic Energy Agency. These proposals were in fact made to the Soviet Agency and were outlined by the U.S. Secretary of State.

ROAD CONDITIONS AFTER LAYING CABLES AND MAINS

DISCUSSIONS are taking place between Doncaster Corporation, the N.E. Electricity Board and Northern Gas Board, concerning the reinstatement of roads after cables and gas mains have been laid. The practice is that the Council carries out permanent reinstatement, but complaints have been made about the unsatisfactory temporary reinstatement carried out pending the Council's work. Both undertakings state that nearly all cables and mains were laid by contractors, and although it was difficult to ensure that they kept the temporary work in satisfactory condition, efforts would be made to avoid cause for further complaints.

The First Half-Century

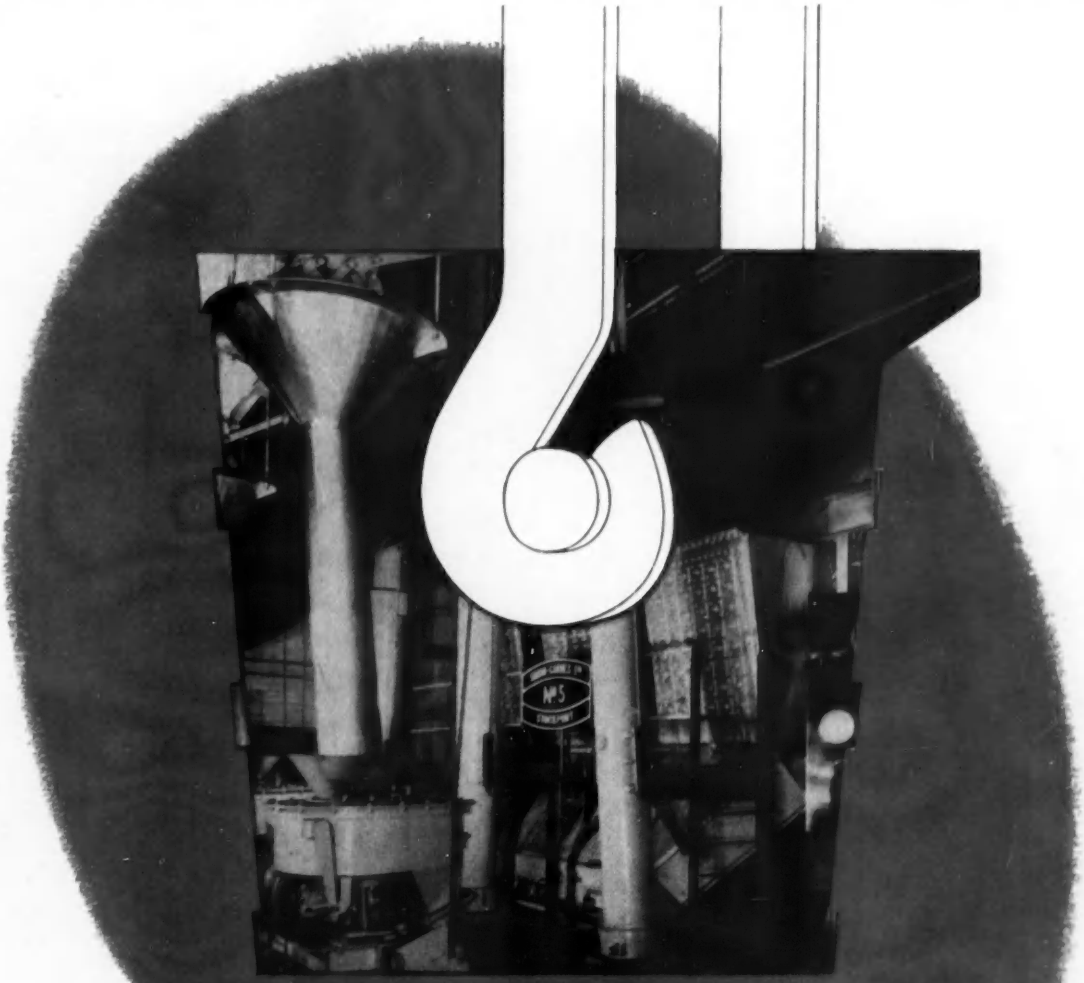
Canon Rawnsley writes to *The Times*: A great injury is being done to the grand pass of Llanberis. The N. Wales Electric Power Co. are putting up poles through the pass to convey the cable to Llanberis quarries from their station at Nant Gwynant. Another set of poles crosses the shoulder of Snowdon southward, to other quarries. The cable is carried on double poles with cross-bars, and the sets of poles come close to one another. You can judge the effect of such a cable near the stream right down the beautiful pass of Llanberis. The cable might have been put underground, but this would have cost more money. It is sad that men like the owner of Llanberis quarries and some of the property traversed by the cable should not have obliged the cable to be put underground.—*From our issue of* 24 *Aug.*, 1905.

BOARD REFUSED JUDGEMENT IN H.P. CLAIM

MUCH publicity has been given to the Oldham County Court case in which the N. Western Electricity Board claimed £32 which they alleged was due under a hire-purchase agreement on a cooker. The Board maintained that the agreement was made with a customer, then living in premises scheduled for demolition, in Jan., 1953, and under it a sum of £1. 2s. 1d. was to be paid quarterly. Three instalments were paid, but in Oct., 1954, with five payments outstanding, the Board took the cooker back. The customer told the court that after that, the Board sent a letter in March saying that the agreement would be terminated on 19 Mar. and the cooker removed. It was explained that having moved to a new house there was a cooker installed there.

Giving judgement, Judge F. Raleigh Batt said the cooker was taken away in Nov. without warning. It was true that payments were in arrear. In March the Board sent an undated letter stating that "notice was hereby given that the agreement will be terminated on 19 March." It seemed monstrous, the Judge said, that the Board in breach of the agreement, having taken the goods away without terminating that agreement, should now seek to recover the arrears. By taking the article away, the Board had repudiated the agreement themselves. He refused to give the Board judgement.

Rapid progress is being made on Tubela Engineering's new factory at Hainault



STEAM *and the making of steel*

The general expansion in steel production is making complementary demands on Simon-Carves steam raising plant for electricity generation. Four Simon-Carves 87,200 lb/hr boilers have been installed at the Margam works of the Steel Company of Wales and the picture above shows one of the units in an extension comprising two 100,000 lb/hr boilers in the Simon-Carves boilerhouse at the Ebbw Vale steelworks of Richard Thomas & Baldwins Ltd.

Steam power by Simon-Carves Ltd

SIMON ENGINEERING GROUP

STOCKPORT, ENGLAND

OVERSEAS COMPANIES | *Simon-Carves (Africa) (Pty) Ltd: Johannesburg* *Simon-Carves (Australia) Pty Ltd: Botany, N.S.W.*

S.C.96

Meter Testing and Servicing for Scotland

Facilities are now available at the Ferranti factories at Dundee and Edinburgh for the servicing and testing of Ferranti meters. A trained team of experts, equipped with the latest type of meter testing equipment, are able to offer a service to the Scottish Power Supply Authorities, for the whole of Scotland. This is a further example of how Ferranti Ltd. are serving Scotland in the electrical field.

F
FERRANTI

This service is available at the:
FERRANTI SERVICE DEPARTMENT · KINGS CROSS ROAD · DUNDEE *in the*
NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD AREA
and at the FERRANTI SERVICE DEPARTMENT · FERRY RD · EDINBURGH 5 *in the*
SOUTH OF SCOTLAND ELECTRICITY BOARD AREA

Behind this service are the vast resources of

FERRANTI LTD

PIONEERS OF ELECTRICAL PROGRESS WITH OVER 70 YEARS' MANUFACTURING EXPERIENCE

FM113/2

Even Illumination in Blackpool Dress Shop

A LADIES' fashion shop is the latest premises in which the Lumenated Ceiling has proved effective. This form of overall illumination devised by Lumenated Ceilings Ltd. has been successfully installed in a private office and car showrooms. The shop recently concerned is that of Jeanne Stuart (Blackpool) Ltd. The installation comprises a false ceiling of corrugated vinyl plastic erected below fluorescent lamps, providing even illumination throughout the shop, obviating any "mirror" effect, and presenting a clean appearance when the lamps are not in use. This particular scheme is in three sections—the windows, shop and fitting rooms. In the windows 8 ft 125 W fluorescent tubes, in a plenum depth of 2½ ft have been fitted. The shop is roughly twice that area and is illuminated by six 8 ft 125 W and six 5 ft 80 W tubes, with a plenum depth of 1½ ft. The ceiling was installed by Marton Construction Co.

Part of the ladies dress shop in Blackpool illustrating the use of Lumenated Ceiling

CITY AND GUILDS REPORT ON 1953-4 ACTIVITIES

ACTIVITIES of the Department of Technology of the City and Guilds of London Institute during the year ended 30 Sept., 1954, are recorded in a report published by the Department, which was recently received. Amongst the work it discusses is a review by the Electrical Engineering Group Committee of the Department's provision for the electrical industry. This records the decision to prepare two new courses, one for electrical technicians and the other for electrical craftsmen. In preparing these courses, the recommendations of the appropriate I.E.E. Committees have been borne in mind. It is to be noted, however, that the certificates are not provided for in the Regulations and Syllabuses for Telecommunications and Electrical Subjects, 1955-56, which the Department has recently issued. In this latter document, the main changes noted are the introduction of M.K.S. units into the papers on radio and television servicing, and the publication of a new scheme of examination in industrial radiography.

To return to 1953-54, it is to be noted that there was again a record number of candidates at examinations organised by the Department—89,211 in 1954, against 82,298 in 1953. Put in another way, the increased effort of the Department is shown by noting that the number of question papers offered increased by about 90 from 1953 to 1954, reaching a total of 870. Before the war the comparable figure was about 530.

Plant Engineers' Examination Course

LAST January, the City and Guilds published a brochure on Plant Engineering setting out detailed syllabuses for an examination course. The course is to be run at five selected centres in September, at Birkenhead (Technical College), Birmingham (Handsworth Technical College), Blackburn (Technical College), Dartford (College of Technology) and Hatfield (Technical College). In most cases both part-time and evening classes will be offered as demand warrants. The Incorporated Plant Engineers has sent out about 400 letters introducing the course to managements in three of the areas.

Writing Reports

A COURSE of six lectures on the presentation of technical reports is to be given at the Borough Polytechnic. It starts on 20 Oct. and lectures will be given each Thursday by Mr G. Parr. Fee is 10s. Enrolment forms may be had from the Polytechnic's Secretary, Borough Rd, London, S.E.1.

Nine Point Plan to Prevent Coal Crises

THE Engineering Industries Association last week issued a plan designed to ensure that a further increase in the price of coal or a fuel shortage does not occur in the next two years. The plan recommends Exchequer grants to meet the extra cost of imported coal, better leadership within the N.C.B. and more part-time members, more attention to recruitment and the employment of foreign miners. It is also recommended that the development of alternative sources of power should be expedited, notably nuclear power, hydro-electric power, oil burning, and electrification of railways. Encouragement should be given to fuel-saving equipment with 60% tax investment allowances, and the National Industrial Fuel Efficiency Service should be expanded, the Association maintain.

Annual Visits to Factory Postponed

AT this time of year Wild-Barfield Electric Furnaces Ltd., usually announce their winter arrangements for visits to their Watford works of organised parties from engineering societies, technical colleges and the like. Unfortunately we hear that the company has had to forego such plans this year. Reason is that they are carrying out major extensions to the works and various departments have been moved about, resulting in some congestion as well as dislocation of normal manufacturing process. Wild-Barfield hope to open their works to visitors again as soon as possible.

Trade Exhibitions in Birmingham and Nottingham

TWO more trade shows to exhibit privately their range of fires and clocks are being staged by Ferranti Ltd. They follow the most successful display assembled in the Midland Hotel, Manchester, about two months ago. Those recently arranged are at Birmingham and Nottingham. The former is at the Grand Hotel and is open to the trade until tomorrow (26 Aug.), between 10 a.m. and 5 p.m. It was opened on Tuesday. The Black Boy Hotel will be the venue at Nottingham at the end of this month, 30 Aug. to 1 Sept. inclusive. All members of the trade will be welcome. Besides the company's comprehensive range of fires and clocks, special attention is being paid to the Ferranti Fridge-Heater, previously described in our pages.

SMOG EXPERIMENTS

WOOLWICH Arsenal is to be the new headquarters of the smog investigators. The Ministry of Supply are providing an artificial fog chamber, laboratories and offices. Experiments in the prevention and dispersal of fog have been going on for the past two years at Battersea Polytechnic. Explaining the work, Mr R. C. Chamuffin said smog had so far not been quantitatively analysed in Britain, but it was hoped to do so within a few weeks. Explaining how they had succeeded in dispersing small amounts of water fog, he said moisture particles in fog had a positive or negative electrical charge. Those charges repelled each other and the particles remained suspended. The aim was to persuade, by chemical means, the particles to lose their charges of electricity, collide and ultimately fall as rain.

NEWS IN BRIEF

Fuel Efficiency Exhibition is to be held at City Hall, Manchester, between 12 and 22 Oct.

Orders for 46 air navigation beacons and communications transmitters have recently been placed with Redifon Ltd. by India's Civil Aviation Department.

The Hutcheson-Winning Golf Competition staged by the Scottish Centre of the I.E.E. in aid of the Benevolent Fund,

will take place on 6 Sept. at Gleneagles.

An extension of their previous order for "Drake" s.c.a. conductor has been received by Aluminium Wire and Cable Co., Ltd., from the British Columbia Electric Railway Co., Ltd.

Large order for TV studio equipment has been placed with Marconi's Wireless Telegraph Co., Ltd., by Granada TV Network Ltd., Manchester's Monday to Friday programme contractors.

Soc. of Industrial Engineers (28 Victoria St, S.W.1) in association with the Work Study Society are holding a week-end Study Conference on 4 and 5 Nov. at St. Ermins Hotel, Westminster, on "Aids to Effective Production Management."

U.K. Trade Commissioner in Ottawa, Mr K. D. Rogers, has returned to this country, and been succeeded by Mr C. G. Cruickshank, who occupied a similar post in Colombo.

A booklet explaining the opportunities provided in the way of junior and post graduate training schemes in their organisation, has been published by Hackbridge and Hewittic Electric Co., Ltd.

Twenty-fourth annual Leicester and E. Midlands Home Life Exhibition will take place at the Granby Halls, Leicester, from 7 to 17 Sept.

Contract for building work in connection with TV studio accommodation in Dickenson Rd, Manchester, has been placed with J. and J. Parish Ltd. by the B.B.C.

Sheffield branch of E.A.W. recently celebrated their 21st birthday. The occasion was marked by a dinner and by a visit to Hardwick Hall, Derbyshire.

The 500 ft permanent TV mast being built at Pontop Pike should be ready in November. The V.H.F. radio transmitter will be completed some weeks later.

Second International Hotel and Catering Exhibition to be held in Paris Parc des Expositions, Porte de Versailles, from 10 to 21 Nov.

Sayings OF THE WEEK

"The character of the trees is reflected in the spidery steelwork of the pylon. It stands above them all, enhancing but not disrupting the countryside, and giving by its presence a focal point often otherwise lacking, a desirable thing in any landscape." . . . N. E. WIGG, of Sittingbourne, writing to *Daily Telegraph*.

"In 25 years the oil industry will have to provide, not 700 million tons of oil as at present, but 1,500 million tons each year. I have no fear that oil resources themselves will not be adequate; the more serious problem will be how to finance the expansion." . . . Mr C. M. VIGNOLES, managing director of Shell-Mex and B.P. Ltd.

"Certain romantics are saying that the culture and way of life of the Highlands were being destroyed, but they have not to carry a sack of peat from a peat bog to their homes, or light their rooms with a candle or oil lamp." . . . SIR DUNCAN MCCALLUM, M.P.

ELECTRIC SUPPLY NEWS

Belfast

The Corporation electricity undertaking received over 10,600 applications for new and additional supplies last year. In his annual report submitted last week, Mr R. P. Watson, city electrical engineer and general manager, stated that the growing popularity of electricity was evident from the increase in the number of connections and the demand for cooking and water heating equipment. The financial result of the year's working was reasonably satisfactory, for while costs rose, improved efficiency and considerable increase in sales of units, largely offset the effects. Mr Watson reported the saving of over 8,500 tons of coal through higher efficiency, although generation costs rose by £42,300 due mainly to increased coal prices. He warned that the full impact of loan charges in respect of development programmes and recent wage awards had yet to be felt, and urged a greater drive to promote sales. Revenue of the Department after deducting discounts and bad debts, amounted to £2,686,626. Capital charges charged to net revenue account amounted to £402,362 and left a net surplus of £114,419. Units sold totalled 477,464,875, an increase of 32,154,785 over the previous year. Units generated totalled 544,633,810.

Channel Isles

As a result of the Jersey Electricity Company's introduction of a domestic block tariff in place of the previous two-part tariff, prices to domestic consumers have been reduced. The company state that this is the eighth reduction in tariffs since Mr W. K. Allen, managing director, took over in 1953. Unit sales this year are said to be up nearly 20% on last year's figures.

Donegal

Construction work on the power station in the Clady hydro-electric scheme, is expected to begin next month. The Electricity Supply Board hopes to have it in operation within two years. Total cost of this project will be about £600,000. The station will normally be operated by remote control from the projected 5,000 kW sod peat station at Gweedore about 5 miles away. It will be equipped with a horizontal Francis-type turbine coupled to a generator of 4,000 kW output.

Durham

Representatives of the N.E. Electricity Board and Felling U.D.C. have met to discuss the proposed new routes for electricity cables across the Leam Lane housing estate. The work includes resiting towers carrying a 66 kV feeder from Dunston to Carville which supplies power to a large area of Tyneside. Existing wood poles are to be replaced with steel poles, but this is likely to cause some delay due to shortages, and it may be a year before work is completed.

Kettering

Transmission cables between Corby to Irthlingborough must be laid underground, Kettering Rural Council, persisted at a recent meeting. A resolution to this effect was approved despite an anticipated cost of £40,000-a-mile more. Following their meeting last month a deputation met representatives of the C.E.A. A letter in reply pointed out the extra cost which would mean an increase in the total cost of relaying the wire, excluding maintenance and other works, of £500,000. It also stated that to overcome the council's objections concerning spoiling the countryside around Weekly, Warkton and Boughton House, the overhead cable would be taken more to the left at that point. One member of the council rejected the idea of finance being a guide and reminded the council of the recent crash of a bomber into overhead wires. He said there would be no ifs or buts, the cable should go underground.

South Wales

The South Wales Electricity Board have agreed to take over from the National Coal Board responsibility for electricity supplies to three thousand consumers in the Rhymney Valley area. Some of these supplies have already been transferred to the Electricity Board's system and the remainder will be transferred within the next twelve months. The provision of service to these additional consumers has made necessary a re-organisation of certain of the Board's Districts. The re-organisation, which is intended to be brought into force in Oct., will result in the creation of two new Districts in place of three existing Districts. The two new Districts will serve the following localities: A—Merthyr Tydfil and Taff Vale, Hirwaun, Aberdare and Mountain Ash, with the main offices at Merthyr Tydfil; B—Rhymney, New Tredegar, Bargoed, Blackwood, Crumlin, Newbridge, Abercarn and Mynyddislwyn with the main offices ultimately at Bargoed. The first of the two Districts will form part of the Board's Central Sub-Area while the second will form part of the Eastern Sub-Area. Incidental District re-organisations which will be affected at the same time are (*a*) the inclusion of Risca (at present administered from Newbridge) in the District served from Newport, and (*b*) the inclusion of Taffs Well (at present served from Pontypridd) in the Board's Cardiff East Disrict.

LIGHTING SCHEME

Leicester. City Council recommended to approve scheme for conversion of all gas street lighting to electricity at cost estimated a £100,000, and to seek sanction to borrow £10,000 for first phase of scheme.

COMPANY ACTIVITIES

THE price of copper is getting out of hand. The official closing price on Friday was £379½ a ton, an all-time record. The main reason is a sudden demand from Continental buyers in face of an acute shortage, especially of wire bars. A further stimulant has been the raising of the American price by 40 cents per lb. But the American price is still £50—£60 a ton lower than the London Metal Market. Until the unhappy labour position of the copper producing industry in all parts of the world becomes more settled such conditions can be expected to continue. I wonder what the Selection Trust group will do when it makes its next price fixing at the beginning of next month? Its present selling price is £325 a ton as from 2 Aug. Previously it was £280 a ton. We have heard no particular complaints about the copper price recently, but it is certain that the industry must be viewing the situation anxiously, and I expect to hear soon of an acceleration in the tendency to find substitutes.

Hall Telephone Accessories which has not been noted for its expanding tendencies in recent years is now doing something about it. Very wisely, Major O. M. Guest, its chairman, is taking a direct leap into the "robot" industry. His link up with James Gordon and Co. gives him three benefits. James Gordon and Co. itself has the "know how" of designing and installation of automatic control equipment; James Gordon's American associate the Panellit group are rapidly expanding in the manufacture of automation products, the manufacture of which over here will give the third benefit i.e., increased turnover for H.T.A.'s works.

It takes two to three years to get a new modern factory completed. Westinghouse Brake Co. is following the lead of English Electric in acquiring existing factory space. It has been disclosed that it is Westinghouse, well to the fore in contracts for modernisation of the railways, that has made the bid already announced for Douglas (Kingswood), the engineering group which produces the "Douglas" motor cycle and the "Vespa" scooter. The Douglas factory is conveniently situated as regards the Westinghouse main factory at Chippenham. Westinghouse in its offer is prepared to liquidate pre-receivership overdrafts and creditors amounting to around £1 million. The Charterhouse Finance group and the Receiver since 1948, Mr W. Walker, must have heaved a sigh of relief.

It has always been the policy of International Nickel to keep prices of its manufactured metals as stable as possible. It has continued this practice this year but in the results for the June quarter reference is made to the fact that earnings on that occasion benefited from the high prices of copper. At $24,651,663 they equalled $1·66 per share as compared with $16,539,248, or $1·10 per share for the corresponding period last year. The company is this year celebrating the 50th anniversary of its production of the first of its series of high-nickel copper alloys—Monel.—*From our City Correspondent.*

British Relay Wireless and Television Ltd.

The group trading profit for the year ended 30 Apr. last amounts to £524,873, compared with a total of £526,838 for the previous year. After all charges, including depreciation and smaller taxation, the net balance is £161,528 (*£89,476*). There is a final dividend of 11% which again makes the total "A" Ordinary distribution for the year 16%. The £175,000 "B" Ordinary capital is not entitled to dividends until payments of not less than 16% per annum have been made on the "A" Ordinary shares for three consecutive periods. The company was formed in Mar. 1953 and this year's dividend represents the second 16% "A" Ordinary total.

Electrical Components Ltd.

The steadily increased business in the past few years has called for heavier stocks and additional credit to customers —necessitating increasing use of bank facilities, Mr L. S. Seccombe, the chairman reports. It is now proposed to replace part of the borrowed money by firm capital, and consent of the C.I.C. is being sought to the issue of a further 234,707 5s. Ordinary shares, to be issued on a basis of one-for-three.

Hall Telephone Accessories Ltd.

Proposals are being put to shareholders which are designed to take the company into the sphere of automation, electronics and instrumentation by the acquisition of existing businesses. The first step proposed is the acquisition (for 400,000 10s. shares) of James Gordon and Co., an engineering company making automatic controls. This in turn will make a connection with Panellit Inc. of America.

Madras Electric Supply Corpn.

A first liquidation distribution of 20s. 6d. per £1 unit is announced. The Government of Madras acquired the undertaking for £1,612,500 and winding up resolution was passed on 29 Sept., 1950.

M.K. Electric Ltd.

The authorised capital of this private limited company has been increased to £1,500,000.

Newton Brothers (Derby) Ltd.

Although the trading profit for the year to 31 Mar. last, at £271,355, is nearly £7,000 lower than for the previous year, the dividend is raised by 2½% to 20%. The dividend is again 12½% but the special bonus is raised from 5% to 7½%, absorbing £31,794 (*£26,610*). After all charges, including smaller taxation, the net profit amounts to £122,558, compared with £91,654 for the preceding period.

Oriental Telephone and Electric Co.

It may well be that the final purchase price to be paid by the Malaya Government for the acquisition of the Singapore and Johore Bahru undertakings will not be finalised till next year, Mr E. J. Bunbury, the chairman, reports: The sum of Malayan dollars 15 millions on account was paid at the end of 1954 upon handing over of the undertakings. The company has completed an inventory of its assets and is to exchange this with a valuation compiled by the other side. Much depends on the degree of difference betwen the valuations as to when the final purchase price will be determined He emphasised that both sides had done all they could at this stage to provide that the valuations shall be presented on an agreed format, so that differences can more easily be identified and discussed.

Radio and Television Trust Ltd.

The offer by Crompton Parkinson Ltd. to purchase the 6% Preference stock of this concern has been accepted by holders of over 90% of the stock subject to the offer. It remains open until 10 Sept.

E. Shipton and Co. (Holdings)

Full accounts of this telecommunications manufacturing company show a group trading profit of £70,926 for the year to 31 Mar., 1955, against a forecast of £45,000 for the previous year, which was made when the company was made public in March, 1954.

The telephone equipment business of the company has enjoyed a satisfactory trading year. Much of this business is carried out through rental agreements and in this respect there was an increase in rental income of £9,509.

Industrial Appliances Ltd., the wholly owned subsidiary which distributes the plastics manufactures of the parent company, has achieved a 100% increase in turnover compared with the previous year.

The profit shown above does not include that of a new subsidiary company, the National Telewriter Company, acquired in the latter part of the year. This company is soon to market a machine which transmits facsimile written messages between two points up to a distance of 20 miles apart.

The directors have recommended a final dividend of 12½% making a total for the year of 22½%.

Westinghouse Brake and Signal Co.

Approval was given on Monday to proposals to raise the authorised capital from £2½ millions to £3½ millions, and to increase the borrowing powers to £6·7 millions.

Dividend Declared

Desoutter Bros. (*Holdings*). Interim of 12½% (*10%*). It is the intention of the directors to declare all future dividends on the Ordinary shares expressed as so many pence per share and not on a percentage basis on the paid up share capital.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

29 Aug.—Derby T.C. Class A sodium discharge lighting units along A.5111 trunk road.—Advertised in 11 Aug. issue.

29 Aug.—East Riding. Installation at county secondary school at Pocklington. —See 11 Aug. issue.

29 Aug.—King's Lynn T.C. Steel and concrete columns with sodium vapour discharge and fluorescent lamps, etc., for street lighting improvements.—See 18 Aug. issue.

29 Aug.—Lancashire. Supply of 23 items of electrical equipment for County Council.—Advertised in 18 Aug. issue.

29 Aug.—Littlehampton U.D.C. Installation in 12 houses on Wickbourne estate. See 18 Aug. issue.

29 Aug.—Preston. Street lighting equipment for Class A scheme in Blackpool Rd, Lea, and Class B scheme.—Advertised in 28 July issue.

29 Aug.—Taunton T.C. Sodium lighting units on concrete columns, and covered cable along A.38.—See 18 Aug. issue.

30 Aug.—Basingstoke (Hants). Lamps to Park Prewett Hospital in year from 1 Oct. —See 4 Aug. issue.

30 Aug.—Dublin. Removal and replacement of installation at St. Kevin's Instn.—See 18 Aug. issue.

31 Aug.—Seaham U.D.C. Materials for maintenance of 3,600 houses for one year.—See 4 Aug. issue.

1 Sept.—Batley (Yorks). Rewiring at Batley General Hospital.—See 4 Aug. issue.

1 Sept.—Friern Barnet U.D.C. Lanterns, etc., for sodium lighting and Group A concrete columns and dismantling steel columns on N. Circular Rd.—See 11 Aug. issue.

1 Sept.—Co. Limerick. Installation in Courtenay Boys' school.—See 11 Aug. issue.

1 Sept.—New Windsor T.C. Installation in reconstruction work at Alma Rd Depot.—See 4 Aug. issue.

2 Sept.—Middleton T.C. Electrical installation in 7 shops and 5 maisonnettes on Hollin estate. G. Syddall, Borough Architect, Town Hall.

2 Sept.—Stranraer T.C. Mercury vapour Class A street lighting lanterns, control gear, steel columns, etc.—See 11 Aug. issue.

2 Sept.—Sunderland T.C. Installation at Castle View primary junior schools.—See 11 Aug. issue.

3 Sept.—Alsager U.D.C. Group A street lighting.—See 18 Aug. issue.

3 Sept. — Ashton-in-Makerfield U.D.C. Electrical installation in 8 bungalows on Bolton Rd estate. Surveyor, Town Hall.

3 Sept.—Failsworth U.D.C. Group B columns, sodium and tungsten lamps, etc., for street lighting.—See 11 Aug. issue.

3 Sept.—Rothwell (Yorks) U.D.C. Sodium discharge street lighting units on concrete columns on Wood Lane estate.—See 18 Aug. issue.

5 Sept.—Carlisle T.C. Installation in 252 dwellings.—See 11 Aug. issue.

5 Sept.—Cheltenham T.C. Group A sodium discharge lighting along Bath to Lincoln trunk road.—Advertised in 4 Aug. issue.

5 Sept.—Heckmondwike U.D.C. Installation in 10 houses on Dale Lane estate. —See 11 Aug. issue.

5 Sept.—Hereford T.C. Group B concrete columns with sodium discharge lamps. —Advertised in 18 Aug. issue.

5 Sept.—Kincardine. Installation in 50 houses at Portlethen Station.—See 11 Aug. issue.

5 Sept.—Mangotsfield U.D.C. Installation of street lighting in Soundwell Rd, Victoria and North St. Surveyor, Council Offices, South View, Staple Hill, Bristol. Deposit £2. 2s.

5 Sept.—Nantwich U.D.C. Supply and erection of 142 electric street lamps and dismantling of gas lamps. E. H. Bailey, Engineer and Surveyor, Brookfield Hse.

5 Sept.—N. Ireland. Electrical installation at Waringfield Hospital, nr. Moira, for N.I. Tuberculosis Authority. W. Harvey, Secretary, 27 Adelaide St, Belfast. Deposit £3. 3s.

5 Sept.—West Hartlepool T.C. Installation in 114 three-storey flats on Owton Manor estate.—See 11 Aug. issue.

6 Sept.—Chertsey U.D.C. Improved Group B street lighting in New Haw and Addlestone area.—See 18 Aug. issue.

7 Sept.—Bedwellty U.D.C. Group A street lighting systems along about 11 miles of A4048, A4049 and A469.—See 18 Aug. issue.

7 Sept.—Harrow T.C. Supply and installation of lanterns, lamps and control gear comprising 113 3/80 W fluorescent, 19 400 W mercury and 42 140 W sodium units, for Group A lighting along various roads. J. H. Melville Richards, Borough Engineer, Council Offices, 48 Uxbridge Rd, Stanmore. Deposit £2.

7 Sept.—Kingussie (Inverness) T.C. Steel columns, lanterns, lamps, etc., for sodium lighting along A.9.—See 28 July issue.

7 Sept.—Manchester T.C. Installation at Wythenhawe fire station.—Advertised in 18 Aug. issue.

8 Sept.—Cannock U.D.C. Provision and installation of 30 140 W sodium and 7 3/80 W fluorescent lighting units on 25 ft concrete columns on different sites. E. Lomax, Engineer and Surveyor, Council Hse. Deposit £2. 2s.

8 Sept.—Luton T.C. Class B concrete columns with sodium discharge lighting, and conversion of Class A units.—See 18 Aug. issue.

8 Sept.—Rhyl U.D.C. Class A concrete columns with sodium vapour discharge lanterns on Coast Rd and Rhuddlan Rd. —See 18 Aug. issue.

9 Sept.—Belfast T.C. Extensions to and modifications on existing Reyrolle switchboards at six substations; and five outdoor transformers.—Advertised in 21 July issue.

9 Sept.—Bilston T.C. Group A lamps on concrete columns and Group B lighting units on various roads.—See 18 Aug. issue.

9 Sept.—Dumfries. Electrical installation in new laboratory at Dumfries and Galloway Royal Infirmary. Hulley and Kirkwood, consulting engineers, 36 Elinbank Cresc., Glasgow.

9 Sept.—Edinburgh T.C. Installation in houses in Coniston area and Loaning Rd. —See 11 Aug. issue.

10 Sept.—Bredbury and Romiley U.D.C. Electrical wiring of 56 houses on Cherry Tree estate, Romiley. T. P. Hodkinson, Engineer and Surveyor, Council Offices, Bredbury.

10 Sept.—Cambridge T.C. Lamps in year from 1 Oct.—See 18 Aug. issue.

10 Sept.—Mitcham T.C. Erection of 359 single arm and 1 double arm concrete columns with 140 W sodium discharge lamps, ancillary equipment and wiring for street lighting improvements. Borough Engineer and Surveyor, Town Hall.

10 Sept.—Wirral U.D.C. 1¼ miles of Group B street lighting at Heswall.—See 18 Aug. issue.

12 Sept.—Sutherland. Installation in Durine J.S. school extensions, Durness.— See 18 Aug. issue.

14 Sept.—East Grinstead U.D.C. In-filling existing 140 W sodium discharge lighting along London-Eastbourne Rd.—See 18 Aug. issue.

14 Sept.—Tunbridge Wells T.C. Con-

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 117 queries answered this week

"Moroll" fat extractor, makers of? L.B. —Catering Wholesalers Ltd., 32 Old Church, S.W.3.

"Airmaster" radio sets, makers of? J.C. —Mervyn Sound and Vision Co., Ltd., Cope Rd, St. Johns, Woking.

Electric frypans, makers of? G.B.—Sunbeam Electric Ltd., 14/16 Old Quebec St, W.1. S. I. Engel, 23/25 Kensington Park Rd, W.11.

Electric de-horners for cattle, makers of? A.B.—Cooper-Stewart Engineering Co., Ltd., Stewart Works, Works Rd, Letchworth. J. McCubbing, Kissock, Beeswing, Dumfries.

"Calor" curling tongs, suppliers of? S.B. —S. D. Sullam Ltd., Africa Hse, Kingsway, W.C.2. "Calor" appliances are not being imported at the present time.

Small portable spot welders supplied as attachment to arc welders, makers of? A.W.—Triangle Products Ltd., Greencroft Mill, Manchester Rd, Hyde, Ches.

crete street lighting columns in Class B with lanterns, etc., for Sherwood estate extensions, Liptraps Lane and industrial estate.—See 11 Aug. issue.

17 Sept.—Bebington T.C. Automatic private telephone exchange in new town hall.—See 11 Aug. issue.

17 Sept.—Belfast. Two electrically-driven drainage pumps at Alexandra Graving Dock.—See 18 Aug. issue.

17 Sept.—Eire. Electrical installation at Athlone District Hospital. J. C. Costello, consulting engineer, 21 Leeson Park, Dublin. Deposit £12. 12s.

17 Sept.—Wakefield. Hospital Management Committee No. 9 is compiling list of firms from whom tenders may be invited in respect of (*a*) electrical work, (*b*) supply of electric lamps, and (*c*) supplies or work of minor nature concerning electrical fittings. Apply to W. Read, Group Secretary, 113 Northgate.

19 Sept.—Kingston-on-Thames T.C. Six sets of electrically driven vertical unchokeable sewage pumps.—See 18 Aug. issue.

19 Sept.—Waterford (Eire). Installation at Central Technical Inst., Parnell St.—See 28 July issue.

22 Sept.—Belfast T.C. 10-ton overhead travelling crane and two electric hoist blocks for Power Station West extension. —Advertised in 11 Aug. issue.

26 Sept.—Newcastle-on-Tyne. Two 6-ton semi-portal electric cargo cranes for Tyne Commission Quay extension.—See 11 Aug. issue.

1 Oct.—Bristol. Supply of electric welding equipment for College of Technology. Chief Education Officer, Council Hse, College Green.

1 Oct.—Islington B.C. Rewiring of the Council's Public Baths, Greenman St. —Advertised 14 July issue.

10 Oct.—Stockport T.C. Rewiring installation at town hall. Apply by 5 Sept.—See 18 Aug. issue.

14 Oct.—Edinburgh T.C. Installation in 47 houses in Craighall Rd, Eversley. Apply by 1 Sept.—See 18 Aug. issue.

No date stated—Prestwick T.C. Relighting trunk road A77 over 1¼ miles comprising fluorescent lanterns on steel columns. Apply to Burgh Surveyor, Municipal Chambers.

No date stated.—N. of Scotland H.E. Board. Supply and erection of 33 kV switchgear and ancillary equipment for Coupar Angus substation. Kennedy and Donkin, 12 Caxton St, London, S.W.1. Deposit £2. 2s.—Advertised in this issue.

No date stated.—N. of Scotland H.E. Board. 193 miles of h.v. and l.v. wood pole overhead lines, etc., in Ardnamurchan and Morven district.—Advertised in 18 Aug. issue.

Trade Notes

Agency. Igranic Electric Co., Ltd., state that Alan Colless Pty Ltd. have appointed Clark-Strickland Pty Ltd., 17 McKillop St, Melbourne, Australia, to act as their agents for Igranic motor control gear throughout Victoria.

Address Changed. Hotpoint Electric Appliance Co., Ltd., Cardiff office is now at 86-88 Adam St. Tel. No.: Cardiff 32318.

Change of Name. India Rubber Gutta Percha and Telegraph Works are altering their name to Silvertown Rubber Co., Ltd., as from 1 Oct. The company has used the name "Silvertown" as its principal and general trade mark, and has in fact been known as the Silvertown Co. for most of the time since the firm's registration in 1864.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 23 August

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	378	+16	239½
„ (3 months)	370½	+18½	237½
R.S.T. (Rhodesian Selection Trust) group price*	325	—	—
LEAD, refined pig, min. 99·97% purity (cash)	106½	+1½	99
„ (3 months)	106	+1	97½
TIN, refined, min. 99·75% purity (settlement)	751	−2	732
„ (3 months)	748	—	732
ALUMINIUM, ingots 99·99·5%	171	—	156
ZINC, virgin, min. 98% purity (cash)	89½	+½	77½
„ (3 months)	89½	+⅝	77½
RUBBER No. 1, RSS, spot (per lb.)	41½d.	+1½d.	20½d.
„ c.i.f. basis, ports, Oct. (per lb.)	41½d.	+2½d.	19½d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	56½	—	52
Mild Steel Tape (0·04 in.)	43½	—	40½

(*Fixed price c.i.f. U.K., operative till end of August and then subject to change at 24 hours' notice, to "consumers willing to instil a degree of stability into the resale price.")

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

16 Sept.—South Africa. Supply of 4,620 yd of 0·25 sq in. in cross section 33 kV "H" type cable L.A.S. 3-core with either shaped or circular conductors, Contract E2607. Also supply of 3,768 yd of 0·2 sq in. oil pressure filled 33 kV "H" type L.A.S. 3-core cable, Contract E2608. Separate tenders. Corpn. of City of Durban, Municipal Buildings, West St, Durban. B.o.T. (Refs.: ESB 17233/55 and 17234/55 resp.).*

20 Sept.—Portuguese East Africa. Tenders (201/55) invited for supply of two generators of 250 kW and 125 kW respectively with auxiliary gear, spare equipment and switchboards for generating station at Pafuri. Ports, Railways and Transport Dept., Lourenco Marques. B.o.T. (Ref.: ESB 16580/55).*

22 Sept.—Australia. Tenders (55/7) invited for supply of two 10/12·5 MVA 33 kV/11 kV O.L.T.C. transformers. Southern Electric Authority of Queensland, Boundary St, Brisbane. B.o.T. (Ref.: ESB 16763/55).*

23 Sept.—Uruguay. Supply of total of 1,635,000 black coloured conductors with outdoor insulation for Administracion General de las Usinas Electricas y los Telefonos del Estado, Montevideo. Specif. No. 2390. B.o.T. (Ref.: ESB 16755/55).*

24 Sept.—Persia. Supply of 100 kW short-wave transmitter, studio equipment, receivers, transformers, cable and accessories. Tender No. 21. Ministry of Posts, Telegraphs and Telephones, Maidane Sepah, Tehran. B.o.T. (Ref.: ESB 16737/55).*

25 Sept.—New Zealand. Supply of one 3-phase star connected 11kV 30,000 kVAR shunt reactor of outdoor type, oil immersed and preferably naturally cooled. State Hydro-Electric Dept., Wellington. Contract No. 286. B.o.T. (Ref.: ESB 16703/55).*

28 Sept.—Egypt. Cairo Gas and Electricity Administration require supply of 60,000 a.c. watt hour meters for l.v. distribution systems, single-phase whole current credit meter single rate two wires 190/230 V, 50 c/s. B.o.T. (Ref.: ESB 17037/55).*

4 Oct.—Egypt. Supply and erection of five transformer stations at Edfina, El Abbassah Sammanoud, Nag-Hammadi and Beni Suef, together with switchgear, etc. Director-General, Mechanical and Electrical Dept., Ministry of Public Works, Cairo. B.o.T. (Ref.: ESB 16313/55).*

12 Oct.—Australia. Supply of 18 circuit-breakers, a resistor and 42 transformers of various types for State Electricity Commission of Queensland, Scottish Union Hse., Eagle St, Brisbane. Specif. TF/29. B.o.T. (Ref.: ESB 16279/55).*

12 Oct.—Australia. State Electricity Commission of Queensland invites tenders (specif. No. TF/36) for main transformers operating at 132 kV, 66 kV and 11 kV, and shunt reactors operating at 11 kV, for Tully Falls power station and Townsville and Ingham substations. Commission is at Scottish Union Hse, Eagle St, Brisbane. B.o.T. (Ref.: ESB 16221/55).*

14 Oct.—Australia. Contract E.24/55 calls for manufacture, supply, etc., of coal handling plant at Tennyson power station together with all accessories and auxiliaries. Documents from Chief Engineer and Manager, Dept. of Electricity, Brisbane City Council, Adelaide St, at 10s. 6d. per copy. B.o.T. (Ref.: ESB 16298/55).*

31 Jan., 1956.—Australia. Manufacture, supply, etc., of signalling equipment for Roma St—Corinda section of Brisbane suburban railways. Documents from Signal and Telegraph Section of Chief Engineer's Branch, Queensland Railways, Upper Edward St, Brisbane, at £50 a set.

Contracts Placed

Dartford T.C. Supply and erection of street lighting at Temple Hill, Joyce Green Lane and Littlebrook Manor Way, London Electricity Board, £3,057.

Durham R.D.C. Electrical materials for 180 new houses: fittings and cables and fires, Z Electric Lamps and Supplies; washboilers, S. Gratrix and Co., Ltd.

Kensington. Installation in two L.C.C. blocks of dwelling at Kensal Hse, Buchanan and Curwen Ltd., £3,242.

Lambeth. Main electric cables at Lambeth Hospital, William Steward and Co., Ltd., £3,484; and bed lift at same, Marryatt and Scott Ltd., £3,720.

Longbenton U.D.C. Installation in 30 houses on Fordley estate, Forest Electrics.

Wallsend T.C. Electrical installation at Carville school, Tanjon Ltd.; similar work at Western school, A. T. Jennison.

BUSINESS PROSPECTS

Home

Bath T.C. Scheme being considered for new office and other accommodation at the Pump Room. First stage will include shopping frontage in York St. Architects are Gerrard, Taylor and Partners, 4-5 Bridge St. Cost estimated at £42,700. Also, redevelopment of Avon St-Milk St area expected to include technical college, swimming bath, hospital, business premises, etc. Blocks of shops and flats in Walcot St are under consideration.

Beckenham. Ministry approval sought for new outpatients' dept. at Beckenham Hospital to cost about £77,000. Hospital Board have appointed Harding and McDermott, consulting mechanical engineers.

Belfast. G.P.O. plans to erect block of offices in Victoria Sq. Estimated cost £250,000.

Bexhill (Sus). Scheme in hand for erection of extensions at Bexhill county grammar school at estimated cost of £64,616.

Brighton T.C. Construction of 18,000 sq ft factory on Lr. Bevendean industrial estate. D. J. Howe, 26-30 King's Rd.

Chigwell (Essex). It is proposed to erect residential special school in district at estimated cost of £268,105.

Coventry. Architects for new printing works in Corporation St for Coventry Newspapers Ltd. are L. A. Culliford and Partners, 47 Essex St, London, W.C.2.

Derby. Hunt Lea Estates (Builders and Contractors) Ltd., Duffield Rd, Allestree, propose to erect group of shops and about 300 houses at Hollies Farm.

Durham. It is proposed to erect grammar-technical school at Washington at cost of £235,000.

Easington (Dur) R.D.C. Surveyor has been asked to report on cost of installing additional power points in council houses.

Gateshead T.C. Borough Engineer to prepare plans for £75,000 crematorium at South Cemetery.

Glasgow T.C. Construction of 42 houses in Mosefield St. Architectural and Planning Dept., 20 Trongate.

Haverhill U.D.C. Erection of 22 dwellings on Parkway estate, Burton End. J. C. Myers, High St.

High Wycombe. Brocklehurst and Cooper, 1a Crendon St, are architects for factory proposed by Merritt and Hatcher Ltd. Cost will be about £80,000.

Leigh (Lancs). C.C. recommended to approve expenditure of £51,639 for extensions to Manchester Rd county secondary modern school.

Littlehampton. C.V.A. Jigs Moulds and Tools Ltd., of Portland Rd, Hove, are planning erection of new works covering 240,000 sq ft on Laneside industrial estate. First part will be 45,000 sq ft foundry.

Newcastle (Staffs) R.D.C. Layout plans approved for 30 houses at Hill Chorton.

Northumberland. Quantity surveyors for proposed Tweedmouth county modern school are J. P. Allen and Hill, Tankerville Terr, Newcastle. Following architects have been appointed: Reavell and Cahill, Lloyds Bank Chambers, Alnwick, for Alnwick secondary modern school; P. L. Browne, Son, Harding, Pearl Buildings, Newcastle, for Morpeth secondary modern school; and Gray and Partner, Camden St, North Shields, for Wallsend technical modern school.

Notts. Wolsey Ltd. of Leicester, planning to erect £90,000 factory at Kimberley. Architects are Cecil Howitt and Partners, St Andrews Hse, Nottingham.

Portarlington (Eire). Erection of 52 houses in Bracklone St. Architect is F. Gibney, 29 Merrion Sq North, Dublin.

St. Helens T.C. Erection of 61 dwellings at Thatto Heath. M. Ward, Borough Engineer, Town Hall.

Salford T.C. Erection of St. Albert's R.C. secondary school, Pendleton. Architects, J. C. Prestwich and Sons, Bradshawgate Chambers, Leigh.

Shaftesbury R.D.C. Construction of 40 dwellings in Tomlins Lane, Gillingham. J. Hoy, Council Offices, Bimport.

Shoreditch B.C. It is planned to erect four 11-storey blocks, each comprising 44 flats; one will be in Hobbs Place area, two on Wenlock Barn estate, and one on St. Mary's estate.

Southend-on-Sea. Final plans approved for construction of £125,000 Cliffs Pavilion at Shorefields.

Stockport T.C. Construction of children's home at Brinnington. Borough Surveyor, Town Hall.

Stockton-on-Tees T.C. Construction of 42 houses adjoining Albany Rd estate. T. C. Hartley, Borough Architect, 28 The Square.

Taunton. Scheme in hand for shopping centre on Priorswood estate including 3-storey block of 15 shops with maisonnettes. Cost estimated at £70,000.

Whitley Bay. Falconer and Prentice, 17a Northumberland Sq, North Shields, prepared plans for garage, showrooms and office. Tenders being invited.

Wolverhampton T.C. Erection of 232 flats and houses on Dale St site. Borough Engineer, Town Hall.

Overseas

Germany. Konrad-Beland, Hamburg-Wandsbek, Wandsbeker, Zollstrasse 91-95, are interested in importing electric hedge clippers from the U.K.

Gazette Announcements

COMPANIES ACTS

Newport's Electrics (Southampton) Ltd. Resolution for voluntary winding-up passed at meetings on 4 Aug. N. W. Osborne, C.A., 11-12 Finsbury Sq, London, E.C.2, has been appointed liquidator.

BANKRUPTCY ACTS

Dividends

Birmingham. Albert Fielder, radio and electrical retailer trading as A. Fielder and Co., at 314 Shortheath Rd, and 4 Cooksey Lane, Erdington. Third and final dividends of ¼d. in £ payable on 31 Aug. at Official Receiver's Office, Somerset Hse, 37 Temple St, Birmingham.

Liverpool. Herbert Pryor, electronic engineer, trading at 36 Low Hill, Liverpool 6. First and final dividends of 7d. in £ payable at 5 Rumford Place, Liverpool, on 23 Aug.

Release of Trustee

Southend-on-Sea. Albert F. Ayres, electrical contractor of 104 Bridgewater Drive, Westcliff-on-Sea. Trustee was R. K. Clark, Official Receiver, Somerset Hse, 37 Temple St, Birmingham.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

Planet Shades Ltd. Manufacturers and distributors of lampshades, etc. Nom. cap.: £100. Dirs.: J. Howell and A. Gluck, 67 Kyverdale Rd, N.16. Sub.: E. J. Howell, 11 Copperfield Hse, Henry Dicken Court, W.11.

W. Neale (Successors) Ltd. National Provincial Bank Chambers, Five Ways, Birmingham 15. Mechanical, electrical, chemical and general engineers, etc. Nom. cap.: £2,000. Dirs.: Marjorie B. Neale and Elsie M. Speakman.

J. R. Calverley and Co. (Bolton) Ltd. 123 Blackburn St, Radcliffe, Manchester. Retailers of and dealers in radio, television and electrical apparatus, etc. Nom. cap.: £3,000. Dirs.: J. R. Calverley and Edith M. Calverley.

J. Russell Electronics (Distributors) Ltd. Triumph Hse, 189 Regent St, W.1. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: C. W. A. Artis, 12 Bushey Rd, Shirley, Croydon; and G. Winter, 4 Talbot Rd, W.2.

Neon Manufacturers Ltd. 13 St. James's Row, E.C.1. Manufacturers of and dealers in neon signs, etc. Nom. cap.: £1,000. Dirs.: F. C. Dillnutt and Mrs M. D. Dillnutt.

Chilton Circuit Breakers Ltd. Manufacturers of and dealers in electrical switchgear, circuit breakers, dynamos, etc. Nom. cap.: £100. Dirs.: A. R. Ward and C. A. F. Shapcott. Subs.: P. E. Bridge, 34 Trebovir Rd, S.W.5; and G. F. Calderan, 42 Mount Park Cres, W.5.

W. A. T. Services (Birmingham) Ltd. 33 Floodgate St, Birmingham. To take over business of radio, television and electrical engineers carried on at Birmingham by John A. Adams and Lawrence J. Thompson. Nom. cap.: £5,000. Dirs.: C. F. Wain, J. A. Adams and L. J. Thompson.

E. W. Carr Ltd. 61 Regent Rd, Dudley, Worcs. Plumbers, sanitary and heating engineers, electricians, shipwrights, etc. Nom. cap.: £5,000. Dirs.: E. W. Carr and Mrs K. M. Carr.

Breckwoldt Peel and Co., Ltd. 3 Catherine Place, Buckingham Gate, S.W.1. General importers and exporters, merchants, brokers, shippers, manufacturers of and dealers in electrical, mechanical, chemical, photographic, surgical and scientific apparatus, etc. Nom. cap.: £10,000. Dirs.: W. F. Breckwoldt, Deichstrasse 48/50, Hamburg 11, and H. K. Peel, 12 Grove Rd, Pinner, Middx.

TRADE MARKS

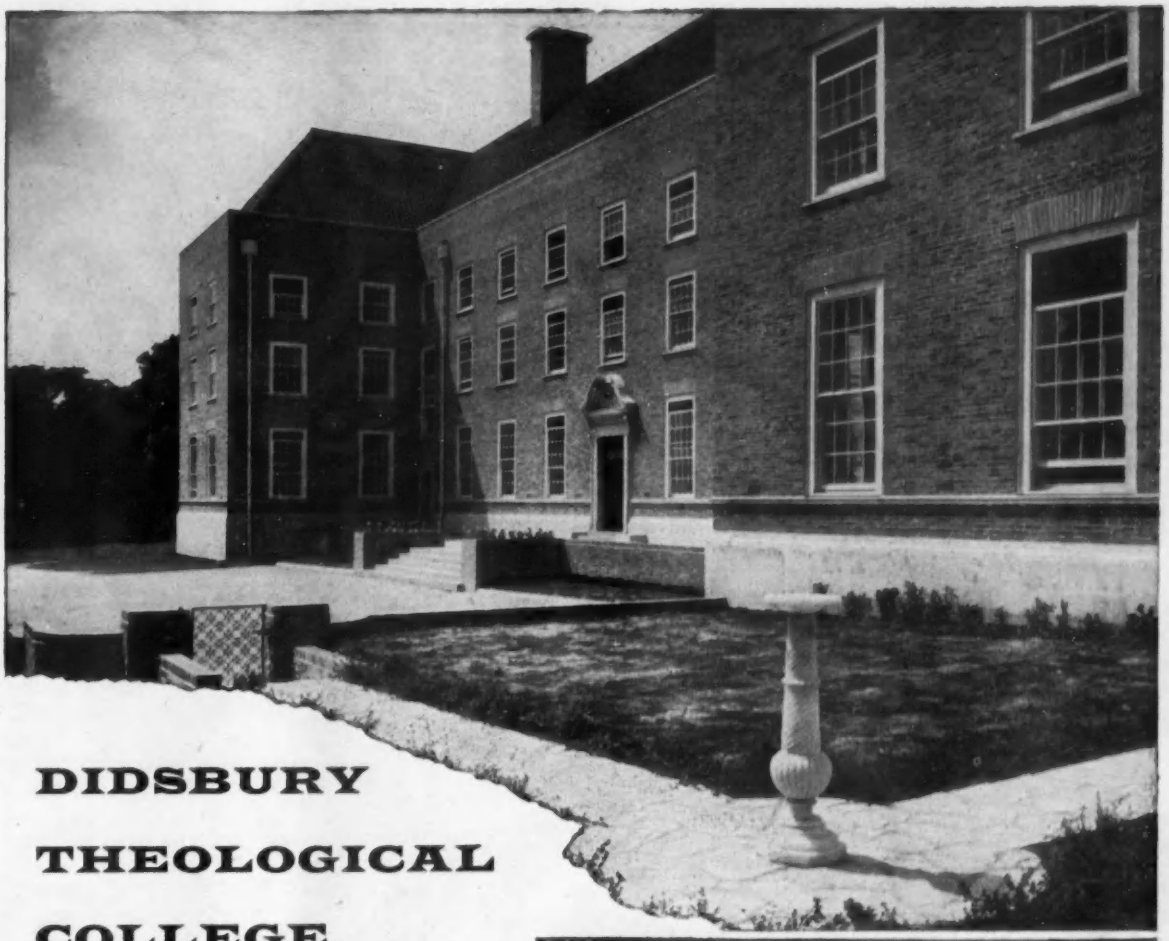
This information is extracted from the Official Journal by permission of the Controller.

Centrex. 741,520. Class 9. Loudspeakers and transformers. Goodmans Industries Ltd., Axion Works, Lancelot Rd, Wembley.

Musilectric. 741,529. Class 9. Electronic and electric apparatus, etc. J. E. Newman, 395 Pinner Rd, Harrow, Middx.

Ether. 741,604, and **Ether Wheelco.** 741,606. Class 9. Instruments and apparatus for measuring, indicating, recording and controlling temperatures, etc. Ether Ltd., Tyburn Rd, Erdington, Birmingham 24.

Warner. B710,641. Class 12. Electric brakes for vehicles. Patent Lighting Co., Ltd., Eden Works, Uxbridge Rd, Hayes, Middx.



DIDSBURY THEOLOGICAL COLLEGE

WESTBURY-ON-TRYM, BRISTOL

The new Didsbury Theological College derives its name from Didsbury in Manchester, its original location. Now at Bristol, a city of strong Methodist traditions, Didsbury, the oldest Theological college, is an impressive and well-designed modern building.

Designed by Sir Percy Thomas & Son, the college has 64 bedrooms, a large common room, dining and kitchen accommodation. The electrical installation was carried out by **Messrs. Buchanan & Curwen Ltd.**, and consists of approximately 400 lighting and heating points, fire alarms and bell circuits.

WIRED THROUGHOUT WITH **HENLEY CABLES**

W. T. HENLEY'S TELEGRAPH WORKS COMPANY LIMITED. 51-53 HATTON GARDEN, LONDON, E.C.1

Types worth knowing

British made throughout, the Browleco Electric Soldering Irons are solidly built to stand plenty of hard wear. All parts are renewable and quickly fitted. All Browleco irons are covered by our Guarantee against electrical breakdown for a period of six months Write for leaflet.

GRAngewood 4003 (4 lines)

BROWNING'S ELECTRIC CO., LTD.

BOLEYN CASTLE, UPTON PARK, LONDON, E.13

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 1/2s.

TENDERS INVITED

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

33 KV OUTDOOR SWITCHGEAR AND ANCILLARY EQUIPMENT FOR COUPAR ANGUS SUBSTATION, PERTHSHIRE

TENDERS are invited for the supply and erection of 33 kV Switchgear and Ancillary Equipment for the above-mentioned Substation. Tender Documents may be obtained on application with a cheque for £2. 2s. (returnable), to the Engineers Messrs Kennedy and Donkin, 12 Caxton St, London, S.W.1. The Board do not bind themselves to accept the lowest or any Tender. H. W. Simpson, Secretary, 16 Rothesay Ter, Edinburgh 3. (T 882)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18–64, or a woman aged 18–59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

FEDERATION OF NIGERIA

A VACANCY exists for an ELECTRICAL ENGINEER (Meteorological Service) in the Federation of Nigeria (BCD 57/14/04).

Duties include determination of types of radio and radar meteorological equipment to be installed, supervision of maintenance and modification and possible operation of such equipment and work in connection with meteorological signals traffic.

Appointment is either pensionable on probation in the salary range £910/£1,560 per annum or on contract in the salary range £1,116/£1,898 per annum with a gratuity of £37. 10s. for every three months' satisfactory service, payable on completion of contract. Government quarters are provided if available, at a rental of 10% of basic salary with a maximum of £150 per annum. Free first class passages for the officer, his wife and assistance of up to £75 each for a maximum of two children is granted in respect of their passages or maintenance in the United Kingdom. Leave is granted at the rate of seven days for each month of resident service in a tour of 18 to 24 months.

Candidates should hold a University degree in electrical engineering or should have passed such examination as will exempt them from Parts A and B of the examination for A.M.I.E.E. and must have special experience of radar and should preferably have experience of meteorological radio and radar aids.

Further details on application, in writing, to the Director of Recruitment, Colonial Office, Sanctuary Buildings, Great Smith St, S.W.1, giving brief details of age, experience and qualifications and quoting the reference number BCD 57/14/04/D10. Closing date for receipt of initial enquiries 18 Oct., 1955. (T 878)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments which are superannuable and subject to medical examination:

FOURTH ASSISTANT ENGINEER (TECHNICAL) in the No. 3 Sub-Area Headquarters at Chester. Salary range £635/£680 per annum (N.J.B. J.13). Applicants should have had experience in the testing and commissioning of electrical plant, on H.V. underground cable fault location and in metering practice, and be in possession of appropriate technical qualifications.

Application forms obtainable from the Manager, No. 3 Sub-Area, Electricity House, Newgate St, Chester. Closing date 12 Sept., 1955.

SECTION ENGINEER in the Oswestry District of the Board's No. 4 Sub-Area. Salary range £715/£760 per annum (N.J.B. E7). Applicants should have experience in all branches of work associated with design, construction and operation of E.H.T., H.T. and L.T. overhead and underground distribution systems, including indoor and outdoor substation equipment. Technical qualifications desirable.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Closing date 12 Sept., 1955. (T 875)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER, MACCLESFIELD DISTRICT

APPLICANTS should be experienced in the supervision of Service Centres, organisation of exhibitions, demonstrations and displays. Experience of contracting and servicing work and possession of the O.N.C. or H.N.C. in Electrical Engineering would be an advantage.

Salary Scale: £755 x £15—£800 p.a. Grade F.7. N.J.B. Conditions.

Application forms can be obtained from the Sub-Area Manager, No. 7 Sub-Area, The North Western Electricity Board, Chapel St, Hazel Grove, Stockport, and must be returned to him by 3 Sept., 1955. (T 876)

CENTRAL ELECTRICITY AUTHORITY
South Eastern Division

MECHANICAL DRAUGHTSMEN

APPLICATIONS are invited for the above superannuated positions in the Construction Department of Divisional Headquarters, Kingston-on-Thames. Salary according to ability within the ranges of Grade 5, £672/£777 per annum and Grade 6, £535. 10s./£661. 10s. per annum including London Allowance. N.J.B. Conditions of Service. Educational facilities at hand and every opportunity provided for advancement by merit. Applicants should have good knowledge and drawing office experience in the preparation of plant and pipework layout and detail arrangements required in power station development. Detailed written applications should be sent to the Establishments Officer, Central Electricity House, Lower Ham Rd, Kingston-on-Thames, by 5 Sept., 1955. (T 870)

EAST ANGLIAN REGIONAL HOSPITAL BOARD

DEPARTMENT of the Regional Architect (Guy Aldis, A.R.I.B.A., A.A. DIPL.) for planning of a scheme for the major development of a General Hospital which the Board is about to undertake.

(1) SENIOR ASSISTANT ENGINEER (Mechanical)—Candidates to be experienced in design and installation of heating, ventilating, steam boiler plant and services, etc., and must be A.M.I.MECH.E., or equivalent. Salary £920/£1,095 per annum.

(2) ASSISTANT ENGINEER (Mechanical)—Candidates to be experienced in the work at (1) and should be A.M.I.H.V.E. or Graduate Members of the I.H.V.E., or equivalent. Salary £640/£930 per annum.

(3) ASSISTANT ENGINEER (Electrical)—Candidates to be experienced in design and installation of electrical engineering services and should be A.M.I.E.E., or Graduate Members of I.E.E. or equivalent. Salary £640/£930 per annum.

(4) ENGINEERING ASSISTANTS—Candidates to be experienced in work described above and possess Ordinary National Certificate (Mechanical or Electrical). Salary £480 (at age 21 or over)/£670 per annum.

(5) DRAUGHTSMEN (Engineering)—Candidates to have had suitable training and experience. Salary £390 (at age 21 or over)/£580 per annum.

Additional increments within the scale based on experience and age may be granted in respect of posts (2) and (3). Commencing salary for post (4) may be fixed at point above minimum but will not exceed £560 per annum.

Applications indicating appropriate post and stating age, qualifications, experience and details of present position with names of three referees to Secretary of Board, 117 Chesterton Rd, Cambridge, by 9 Sept., 1955. (T 869)

CENTRAL ELECTRICITY AUTHORITY
Midlands Division

SHIFT CHARGE ENGINEER is required at Walsall Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule "A," Grade H.7, £840/£900 per annum.

A sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear are required. Appropriate qualifications an advantage.

Apply, quoting vacancy number 42MD, on form AE6, available from Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 3 Sept., 1955. (T 871)

SOUTH EASTERN ELECTRICITY BOARD

SECOND ASSISTANT ENGINEER (OPERATION AND MAINTENANCE)—SURREY SUB-AREA HEADQUARTERS, DORKING

SALARY £975/£1,050 under N.J.B. Class K, Grade 7. Superannuable.

Applicants, preferably Corporate members of the I.E.E. should have extensive responsible experience of the operation of urban and rural networks up to 33 kV with particular reference to system protection. The appointed person will be responsible to the Senior Assistant Engineer primarily for the commissioning of plant and the operation and maintenance of all system protection throughout the sub-area.

Applications naming two referees on forms from C. W. Hughes, B.SC., M.I.E.E., Surrey Manager, Seeboard, Rough Rew, Horsham Road, Dorking, Surrey, by 7 Sept., 1955.

LINESMAN (OVERHEAD POWER)—MID-SUSSEX SUB-AREA (TO BE BASED IN BRIGHTON)

Wages 3s. 11d. per hour for a 44-hour 5-day week under N.J.I.C. Agreement. Applicants should have had experience in the construction and maintenance of steel tower lines.

Applications naming two referees to H. Pryce-Jones, J.P., M.ENG., M.I.C.E., M.I.E.E., Mid-Sussex Manager, Mid-Sussex Hse, North Rd, Brighton, by 7 Sept., 1955.

A. L. BURNELL,
Secretary.
(T899)

SOUTH WALES ELECTRICITY BOARD

require ASSISTANT ENGINEER in District 103 (Cardigan), Western Sub-Area.

Duties mainly will involve survey and construction of Overhead lines together with general assistance in the District.

Salary—Class C, Grade 7 (£635/£680) of the N.J.B. Schedule.

Applications stating age, present position, salary, qualifications, experience and three referees to be addressed to the Secretary (Establishments Section) to arrive by 3 Sept.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (T 873)

LONDON ELECTRICITY BOARD

SENIOR AND ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for the following vacancies. These posts are permanent and superannuable and they are graded under Schedule D of the National Joint Board agreement.

ENGINEERING DRAUGHTSMEN

Commencing salaries dependent upon qualifications and experience within Grade 6, £535, 10s./£661, 10s. per annum, inclusive of London Allowance.

North Eastern Sub-Area

(BASED AT STRATFORD, E.15)
Vacancy No. V/2012/T

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: engineering drawing; plant layout in substations; layouts and site plans of mains work; electrical diagrams.

St. Marylebone/St. Pancras District

(DESIGN AND PLANNING)
Vacancy No. V/1967/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV.

Chief Engineer's Department

(AT STAMFORD ST., S.E.1)
Vacancy No. V/1989/T

Candidates should be experienced in surveying E.H.V. cable routes and have had good experience in making accurate surveys of cable routes during the laying of E.H.V. cables, taking information and sketches on site and producing final drawings.

Chief Engineer's Department

(AT STAMFORD ST., S.E.1)
Vacancy No. V/1989/T

Applicants, required for plant layout, should preferably have served an engineering apprenticeship and have had technical training to Ordinary National Certificate level, together with experience in the layout of transforming plant, H.V. switchgear and cables up to 66 kV. (In this instance an appointment may be made within Grade 5, £672/£777 per annum inclusive.)

SENIOR DRAUGHTSMEN

Commencing salaries dependent upon qualifications and experience within Grade 5, £672/£777 per annum, inclusive of London Allowance.

Contracting Section

(AT STRATFORD PLACE, W.1)
Vacancy No. V/1986/T

Applicants should be capable of completing layouts of plant and associated cabling for large industrial installations.

St. Marylebone St. Pancras District

(AT AYBROOK ST. W.1.)
Vacancy No. V/2001/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV. In addition, the applicant should be capable of supervising Engineering Draughtsmen and/or Junior Draughtsmen, if required.

Application forms for the foregoing vacancies are obtainable from the Personnel Officer, 46/7 New Broad St, London, E.C.2. Please enclose addressed envelope and quote reference No. of vacancy preferred. (T 351)

THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY

Industrial Group Headquarters Risley, Nr. Warrington

invites applications for the post of SENIOR LABOUR MANAGER ON CONSTRUCTION WORKS. Applicants must be fully conversant with all negotiating machinery, and have had experience in handling constructional labour and dealing with Trade Unions on such matters as conditions of work, rates of pay, etc., for Building, Civil, Mechanical and Electrical Labour. The successful applicant will be required to deal with all labour matters on several large construction sites in various parts of the country, and be responsible to the Chief Engineer (Construction).

Salary—£1,160/£1,370 per annum.

Housing accommodation will be available within a reasonable time for the successful candidate, if married; hostel accommodation is also available.

All new entrants under the age of 55 automatically join the Authority's contributory pension scheme.

Send postcard for Application Form to Senior Recruitment Officer, U.K.A.E.A. Industrial Group H.Q. Risley, Nr. Warrington, quoting reference 1,076. (T 898)

CENTRAL ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.MECH.E. for posts (*a*) and Corporate Membership for posts (*b*) an advantage.

(*b*) DEPUTY POWER STATION SUPERINTENDENT, BANKSIDE GENERATING STATION
Vacancy No. 55/647

Candidates should have received a sound technical training in Mechanical and Electrical Engineering, followed by practical experience in the operation, maintenance and administration of a modern Generating Station, coupled with a successful record in the promotion of good labour relations. Salary—Class H, Grade 3=£1,160 p.a.

(*b*) SHIFT CHARGE ENGINEERS, BARKING "C" GENERATING STATION
Vacancy No. 55/648

Practical experience in operation of Generating Station plant essential. Character and ability to deal with Staff problems essential. Salary—Class J, Grade 7=£945 p.a.

(*a*) ASSISTANT SHIFT CHARGE ENGINEERS, BLACKWALL POINT GENERATING STATION
Vacancy No. 55/649

Sound technical training necessary with practical experience in the operation of a modern Generating Station, preferably with pulverised fuel firing. Salary—Class F, Grade 9=£708, 15s. p.a.

(*b*) MAINTENANCE ENGINEER (ELECTRICAL), BRUNSWICK WHARF GENERATING STATION
Vacancy No. 55/650

Experience necessary in Generating Station Electrical Auxiliaries, air-break switchgear, testing and commissioning of protective equipment. Duties include control of Staff of the Electrical Maintenance Department. Salary—Class K, Grade 7=£1,023, 15s. p.a.

(*a*) ASSISTANT ENGINEER (ELECTRICAL TESTING), FULHAM GENERATING STATION
Vacancy No. 55/651

Applicants should have had practical experience in testing and routine maintenance of Generating Station electrical equipment, which includes generators, switchgear, transformers, motors and protective equipment. Salary—Class K, Grade 12=£750, 15s. p.a.

(*a*) SHIFT CHARGE ENGINEER POPLAR GENERATING STATION
Vacancy No. 55/652

Sound technical training with practical experience of operation and control of Boilers, Turbine- and Switchgear. Salary—Class E, Grade 7=£750, 15s. p.a.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, Central Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland St, W.1, to be received within 14 days of this advertisement. (T 896)

A CAREER AS A REGULAR ARMY OFFICER FOR QUALIFIED ENGINEERS

MECHANICAL, ELECTRICAL and ELECTRONIC ENGINEERS are required as officers in the Corps of Royal Electrical and Mechanical Engineers.

There are two methods of entry. These are either:

(1) On a short service commission (which offers a good opportunity of obtaining a permanent commission) with a gratuity of about £100 for each completed year of service on leaving

or

(2) On a Permanent Regular Commission with a valuable pension and a terminal grant of £1,000 (tax free).

Candidates must be physically fit and between the ages of 23 and 28 years old (except for those with previous service in the Armed Forces, who may be 30 years old). They must have passed or be exempt from the examinations of either the Institution of Mechanical Engineers or the Institution of Electrical Engineers, or have a University Degree in Natural Science or Engineering. In addition, 2½ years' experience as an engineer (or 1½ years in the case of University graduates) is normally required. Additional seniority is given for an honours degree and for approved engineering experience.

The pay which Army officers may expect is according to the following table:

Rank	*Normal Age*	*If Single* £	*If Married* £
Lieutenant	23	686	823
Lieutenant	25	723	860
Captain	27	866	1,005
Major	34	1,193	1,330
Lt-Colonel	42	1,512	1,640
Colonel	45	1,795	1,922
Brigadier	49	2,068	2,187
Major-General	49 or over	2,634	2,744

Note.—This is the U.K. scale; there are various additions in certain overseas station.

(In this table the figures of a single officer's pay include an element for food and accommodation which are normally provided in kind. This has been made to provide a direct means of comparison with civilian scales of pay).

For further details please write to:

The War Office (P.A.6(*b*)), London, S.W.1, and quote this announcement. (T 276)

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

FOURTH ASSISTANT ENGINEER (DISTRIBUTION DESIGN)

APPLICANTS should hold at least the Higher National Certificate in Electrical Engineering and have had constructional, operational and maintenance experience on overhead and underground distribution systems.

Salary—N.J.B. Class M, Grade 13, £755/£15/£800 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 8 Sept., 1955.

No. 4 (Leeds) Sub-Area

Wetherby District

THIRD ASSISTANT DISTRICT ENGINEER

Applicants should possess a good general and technical education and training and have had experience in the construction, operation and maintenance of E.H.T. and L.T. overhead and underground distribution systems in a mixed urban and rural district.

The successful applicant will be stationed at the Wetherby Office and should be prepared to reside in that district.

Salary—N.J.B. Class E, Grade 9, £635/£15/£680 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, near Leeds, not later than 8 Sept., 1955. (T 872)

SOUTHERN ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEERS

Newbury Sub-Area

(*a*) SUB-AREA Office, L.18; (*b*) Melksham District, F.13; (*c*) Newbury District, F.13; (*d*) Reading District, H.15; (*e*) Swindon District, F.13;

Salary £515 x £15—£560 per annum.

Portsmouth Sub-Area

(*f*) Aldershot District (Petworth), F.14; (*g*) Basingstoke District, E.13; (*h*) Isle of Wight District, E.13.

Salary £475 x £15—£520 per annum.

N.J.B. Conditions of Service.

Candidates for post (*a*) will be required to assist in the Planning Section, mainly in connection with system calculations.

Candidates for posts (*b*)—(*h*) will be required to assist with distribution duties, including minor construction work and general maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant, etc. These appointments may involve standby duties.

Candidates for all posts should possess suitable technical qualifications.

Application forms for posts (*a*)—(*e*) obtainable from Sub-Area Secretary, 7 Oxford Rd, Newbury, and returned to him, in envelopes suitably endorsed, not later than 9 Sept., 1955.

Application forms for posts (*f*)—(*h*) obtainable from Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, in envelopes suitably endorsed, not later than 9 Sept., 1955.

The successful candidates for the above appointments will be required to contribute to the C.E.A. and Area Boards' Superannuation scheme, if eligible. (T907)

[ELECTRICAL MAINTENANCE ENGINEER

required by the Federal Government of Nigeria for the Department of Civil Aviation for one tour of 12 to 24 months in the first instance either (*a*) with prospect of permanency with salary scale £1,085 rising to £1,315 a year or (*b*) on contract with salary scale £1,170 rising to £1,453 a year and a resettlement grant at the rate of £150 a year. Outfit allowance £60. Free passages for Officer and wife. Assistance towards cost of children's passages or grant up to £150 a year for their maintenance in U.K. Liberal leave on full salary. Applicants, over 25 years of age, must have had considerable experience of the maintenance of large electrical installations and be capable of training and exercising control over junior Nigerian maintenance staff. Duties will include the maintenance of all electrical plant and equipment at Kano and Lagos airports, which are being equipped with modern equipment including high intensity approach and runway lighting, stand-by diesel generating plant, low voltage switchgear and air-conditioning plant. Preference will be given to candidates with previous oversea experience and possessing a knowledge of the installations and maintenance of general plant. Experience of aeronautical lighting installations will be an advantage. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/41160/EE. (T 848)

DRAUGHTSMAN, GRADE III IV (ELECTRICAL)

required for the East African Railways and Harbours Administration for one tour of 36-45 months with prospect of permanency. Salary scale (including inducement pay and present 10% temporary allowance) £825 rising to £1,082 a year. Free quarters or an allowance in lieu. Free passages. Liberal leave on full salary. Candidates should have served a full five years' apprenticeship with a firm of electrical engineers and have had subsequent experience as an electrical draughtsman preparing layout drawings of electrical installations, including distribution mains and static substations, together with experience of extracting and compiling quantities. Candidates should preferably be up to Higher National Certificate standard. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/41162/EE. (T 854)

ATOMIC ENERGY RESEARCH ESTABLISHMENT
Harwell

invites applications for the post of ANALOGUE COMPUTER PROGRAMME ENGINEER to assist a section leader in the development and operation of analogue computers for the investigation of a variety of problems concerning the overall control and safety of nuclear power plant. Duties will include liaison with other engineering groups, Reactor Physics and Electronics Division.

Applicants should be at least 26 years of age and possess minimum qualifications of Higher National Certificate in Electrical Engineering or Higher School Certificate in science subjects, or equivalent qualifications. A degree in science or electrical engineering subjects is desirable together with a knowledge of electronics. Experience of either analogue computing techniques, light electromechanical devices, automatic control or servo-mechanisms would be an advantage.

The successful candidate will be appointed with the grade of Experimental Officer (£775/£945 per annum) and will be required to join the Authority's contributory superannuation scheme.

A house will be available for the selected officer, if he is married and at present lives outside the radius of the Establishment's transport facilities.

Requests for Application Form should be sent on a Post Card to Establishment Officer, United Kingdom Atomic Energy Authority, A.E.R.E., Harwell, Didcot, Berks, quoting 2/103/292. (T 857)

TECHNICIANS GRADES I AND II

required by The Atomic Weapons Research Establishment, Aldermaston, Berkshire, to serve in a team engaged in the planning and maintenance of electrical services for overseas trials, including the provision of adequate spares. The equipment includes diesel and petrol driven generators, L.T. distribution equipment and lead/acid and alkaline batteries. Applicants should have served a recognised engineering apprenticeship and have had previous experience on the type of equipment detailed above. Possession of H.N.C. or O.N.C. for Grades I and II respectively or equivalent qualification is desirable.

The successful applicants will be required to undertake tours of overseas duties of two to six months' duration.

Salary: Grade I £830/£1,015 per annum (male).
Grade II £710 (linked to age 30) £830 per annum (male).

Contributory Superannuation Scheme. Successful married officers now living outside the Establishment's transport area will be eligible for housing on one of the Authority's estates; until housed a lodging allowance may be payable.

Requests for application forms by Postcard to Senior Recruitment Officer at the above address. Quote reference 744/49. (T 880)

CENTRAL ELECTRICITY AUTHORITY
South Wales Division

APPLICATIONS are invited for the following superannuable N.J.B. appointments:

STATION SHIFT CONTROL ENGINEER AT LLYNFI POWER STATION

Vacancy No. 86/55

Salary: G.10—£675 x £15 to £720 per annum.

H.N.C. and experience in power station control room desirable.

ASSISTANT SHIFT CHARGE ENGINEER AT USKMOUTH POWER STATION

Vacancy No. 87/55

Salary: K.9—£840 x £20 to £900 per annum.

H.N.C. and regular apprenticeship desirable.

Experience in modern generating station essential.

Application forms obtainable from Secretary, South Wales Division, Central Electricity Authority, Twyn-y-Fedwen Rd, Gabalfa, Cardiff to be returned by 5 Sept., 1955. (T 901)

THE NORTH EASTERN ELECTRICITY BOARD
Wear Sub-Area

APPLICATIONS are invited for the following appointments:

THIRD ASSISTANT DISTRICT ENGINEER, Chester-le-Street District. Salary, Schedule "A," Class "F," Grade 9—£675/£720. N.J.B. conditions of service.

Applicants must be qualified electrical engineers with sound practical training and experience in the construction, operation and maintenance of overhead and underground networks and associated plant and equipment.

DEMONSTRATOR, Hesledon District.

Applicants should have a certificate of a recognised Domestic Science Training College and/or E.A.W. certificate, preferably the latter; also considerable experience as a Demonstrator or Assistant Demonstrator in the Electricity Supply Industry. Salary—Grade 1, £425/£525 per annum. Annual increments of £20 up to £465, beyond £465 increments subject to certificate of competence.

Applications stating age, qualifications and experience to be received by the Secretary, (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol Hse, Newcastle upon Tyne, within ten days of the appearance of this advertisement. (T 904)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the post of THIRD ASSISTANT ENGINEER in the Generation Operation Section of the Chief Engineer's Department at Broomhill Drive, Glasgow.

Applicants should preferably be in possession of technical qualifications for admission to Corporate Membership of a recognised professional Institution, and should have had some practical experience in a steam power station.

The position is superannuable and the salary will be in accordance with N.J.B. Schedule C, Class AX/DX, Grade 4, £750/£950 per annum.

Applications should be made on the standard application form, which may be obtained from the undersigned, and should be returned not later than 10 Sept., 1955.

J. MEEK,
Secretary.

P.O. Box 173,
351 Sauchiehall St, Glasgow, C.2.
13 Aug., 1955. (T 853)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

FOURTH ASSISTANT ENGINEERS

(1) Enfield district, Northmet Sub-Area. 143/55.R.

(2) Ipswich district, Suffolk Sub-Area. 144/55.R.

(3) Beccles district, Suffolk Sub-Area, (operating from Woodbridge). 145/55.R.

Candidates should have had a sound technical training and experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, including substations.

Salary—N.J.B. Grade 11 as follows:

(1) Class F (£595/£640) plus London Allowance.

(2) Class F (£595/£640).

(3) Class E (£555/£600).

Apply, by letter, within 14 days to the District Manager, Eastern Electricity Board at the following addresses:

(1) 40 Church St, Enfield, Middlesex.

(2) Electric Hse, Ipswich, Suffolk.

(3) The Grove, Ingate St, Beccles, Suffolk.

FOUR ENGINEERING DRAUGHTSMEN NORTHMET SUB-AREA, H.Q., LONDON, N.14

The duties include layout of switchgear, transformers and associated equipment for outdoor and indoor type substations up to 33 kV.

Salary—N.J.B. Schedule D, Grade 6 (£510/£630) plus London Allowance.

Apply, by letter, within 14 days, to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14. (T 923)

CENTRAL ELECTRICITY AUTHORITY
Southern Division

APPLICATIONS are invited for the following posts:

SECOND ASSISTANT STATION CHEMIST, MARCHWOOD GENERATING STATION, SOUTHAMPTON

S/13.715

Applicants should have had practical experience of fuel, water and oil testing appropriate to a modern generating station, and must have a knowledge of boiler chemistry for high steam pressures and temperatures. Experience in the operation of ion-exchange water treatment plant is desirable. A knowledge of metallurgical problems associated with modern power station plant and/or fouling problems arising from the use of oil firing will be an advantage. Applicants should possess at least H.N.C. in chemistry or hold equivalent qualifications.

Salary—N.J.B. Grade K.11 £755/£800.

THIRD ASSISTANT ENGINEER (TESTING), GENERATION (OPERATION) DEPARTMENT, DIVISIONAL HEADQUARTERS, PORTSMOUTH

S/13.716

Applicants should possess a thorough knowledge of thermodynamics and be experienced in the determination of efficiency and losses occurring in large turbines and condensing plant. A sound knowledge of boiler testing is also required and applicants should be well acquainted with all instruments employed in this work. Plant operating experience will be an advantage. Preference will be given to those possessing qualifications admitting to corporate membership of a senior professional institution.

Salary—N.J.B. AX/CX, Grade 4: £750 x £25—£875 x £50—£925.

Special application forms for each post, obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 7 Sept., 1955. Please quote reference E.T.

FOREMAN, MECHANICAL MAINTENANCE MARCHWOOD GENERATING STATION, SOUTHAMPTON

S/13.712

Candidates should preferably have served an indentured apprenticeship in a mechanical engineering works, and must have a wide experience of generating station plant. Preference will be given to applicants with knowledge of modern high pressure boilers and pulverised fuel and/or oil fuel equipment. Experience of control of labour will be an advantage.

FOREMAN, ELECTRICAL MAINTENANCE MARCHWOOD GENERATING STATION, SOUTHAMPTON

S/13.713

Candidates should preferably have served an indentured apprenticeship, and must have had experience of the operation of generating station plant. Experience of the installation of electrical equipment including H.T. and L.T. switchgear, H.V. generators and large electric motors is desirable, and experience of the control of labour will be an advantage.

Salary for each post N.J.I.C. Schedule E. Grade 1 £645 per annum.

Applications, giving details of education, training and subsequent experience, with dates, should reach the Station Superintendent, Marchwood Generating Station, Marchwood, near Southampton, by 7 Sept. (T 919)

SOUTH WALES ELECTRICITY BOARD

require SALES REPRESENTATIVE in District 461 (Pontypool), Eastern Sub-Area.

The successful candidate will be required to advise, under supervision, on supply matters, tariffs and apparatus sales to consumers with domestic or small commercial or industrial installations.

Salary—Grade 1 (£425 x £20—£525) of the N.J.C. Schedule.

Applications stating age, present position, salary, qualifications, experience and three referees to be addressed to the Secretary (Establishments Section) to arrive by 31 Aug., 1955.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (T 874)

GOLD COAST LOCAL CIVIL SERVICE

ELECTRICAL ENGINEERS, GOLD COAST

VACANCIES exist for Electrical Engineers in the Electricity Department of the Local Civil Service of the Gold Coast.

Duties are to take charge of, or assist in, the operation and maintenance of electricity supplies at voltages up to 11,000 V. Appointments are on contract for two tours in the salary range £1,130/£2,020 per annum point of entry depending on professional experience and age. A gratuity of £37. 10s., is payable for each completed 3 months' satisfactory service.

Free first class passages are provided for the officer, his wife, and up to 3 children under 13 years of age. Government quarters, if available, are provided at a rental of £60/£90 per annum. Leave is granted at the rate of 7 days for each completed month of resident service after a tour of 18-24 months.

Candidates, between 28 and 45 years of age, should have passed or be exempt from Parts A and B of the examination for the Associate Membership of the Institution of Electrical Engineering. They should have had five years' experience in power generation, transmission and distribution and consumers' installations, after obtaining the professional qualifications. A candidate who has seven years' experience after obtaining qualifications, is over 28 years of age, and has his A.M.I.E.E., would receive commencing salary of £1,600 per annum.

Apply in writing to the Director of Recruitment, Colonial Office, Great Smith St, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number BCD 145/13/02. (T 849)

CENTRAL ELECTRICITY AUTHORITY
South Eastern Division

MAINTENANCE ENGINEER (MECHANICAL)—KINGSTON "B" POWER STATION

APPLICANTS should preferably possess B.Sc. degree or equivalent qualification. Extensive experience required in the maintenance of high pressure turbine and boiler plant and auxiliaries and in the control of labour. Class G, Grade 6, £840/£900 p.a. plus London Weighting.

GENERAL ASSISTANT ENGINEER (CONTROL)—CROYDON "B" POWER STATION

Applicants should preferably have experience in the operation of E.H.T. switchgear and the parallel running of alternators. Class J, Grade 17, £475/£520 p.a. plus London allowance.

SENIOR DRAUGHTSMAN—CROYDON "B" POWER STATION

Applicants should preferably be educated to H.N.C. standard and have had experience of Power Station design and layout. Schedule D, Grade 5, £640/£740 p.a. plus London allowance.

ASSISTANT ENGINEER (PROJECTS)—LITTLEBROOK POWER STATION

This position requires initiative coupled with an analytical and enquiring mind and the successful applicant will be engaged on projects designed to improve the efficiency of the Power Station in all aspects. He will be responsible for the initiation and carrying out of such schemes. A sound knowledge of modern power station practice and drawing office experience and possession of H.N.C. in Mechanical Engineering desirable. Class L, Grade 9, £900/£975 p.a. plus London allowance.

SHIFT CHARGE ENGINEER—CROYDON "A" POWER STATION

Applicants should have had sound technical training, together with experience in the operation of modern high pressure turbine and boiler plant. E.H.T. switchgear and in the control of labour. Class F, Grade 7, £755/£800 p.a. plus London allowance.

Detailed written applications giving education, present position, experience, etc., should be received by the following not later than 3 Sept.:

1. Station Superintendent, Kingston "B" Power Station, Downhall Rd, Kingston-upon-Thames, Surrey.

2, 3 and 5. Station Superintendent, Croydon "B" Power Station, Beddington Farm Rd, Croydon, Surrey.

4. Station Superintendent, Littlebrook Power Station, Nr. Dartford, Kent. (T 883)

SOUTH OF SCOTLAND ELECTRICITY BOARD
Glasgow Area

APPLICATIONS are invited for the position of SECOND ASSISTANT DISTRICT ENGINEER (Western District).

Applicants should have a sound engineering training and subsequent experience with H.V. and L.V. underground distribution systems, including the operation and maintenance of H.V. and L.V. switchgear and cables and a knowledge of protective gear and fault location. Corporate membership of the Institution of Electrical Engineers or the possession of the Higher National Certificate or an equivalent qualification would be an advantage.

The Salary and Conditions of Employment will be in accordance with the Agreement of the National Joint Board.

Salary Scale: £755/£800 per annum, Class F, Grade 7.

The post is superannuable and the successful candidate may be subject to medical examination. He will also require to reside within reasonable distance of district headquarters.

Applications should be made on form to be obtained from the undersigned and should be sent to the undersigned not later than 12 Sept., 1955.

J. CAIRNS,
Secretary.

P.O. Box 6,
75 Waterloo St, Glasgow, C.2. (T 877)

TECHNICAL INSTRUCTOR
(Electrical)

required by the Government of the Western Region, Nigeria, for two tours of 18/24 months or three tours of 10/12 months. Option of appointment either (*a*) on agreement with prospect of permanent and pensionable employment in salary scale (including expatriation pay) £750 rising to £1,175 a year or (*b*) on temporary contract in salary scale (including expatriation pay) £807 rising to £1,269 a year with a gratuity (resettlement grant) at rate of £100/£150 a year. Outfit allowance £60. Free passages for officer and wife. Assistance towards cost of children's passages or grant up to £150 annually for maintenance in U.K. Liberal leave on full salary. Candidates must have served an apprenticeship and have had good subsequent experience in electrical installation and practice. They must hold a Full Technological or Final C. and G. Certificate in Electrical Installation work or Electrical Engineering Practice. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/40808/EE. (T 879)

EAST MIDLANDS GAS BOARD
Sheffield and Rotherham Division

APPOINTMENT OF ELECTRICAL FOREMAN FOR CAR HOUSE GAS WORKS, ROTHERHAM

APPLICATIONS are invited for the position of Electrical Foreman at the new Gas Works at present in an advanced stage of construction at Car House, Rotherham.

Applicants should be qualified and preferably have had experience in the operation and maintenance of electrical equipment in gas works, including turbo alternators and transformers of 1,000 kVA capacity and control gear for motors up to 500 h.p.

They should also be conversant with Electrical Regulations and be capable of controlling electrical maintenance staff.

The salary will be in accordance with APT 6 (*a*) of the National Salary Scales for Gas Staffs (£590/£670 per annum).

The post is pensionable and the successful applicant will be required to pass a medical examination.

Applications giving details of age, training, qualifications, etc., together with the names and addresses of two referees should be addressed to reach the undersigned not later than 31 Aug., 1955.

C. C. WOOD,
Divisional General Manager.

CCW/EMM/PER.
Gas Offices,
Commercial St, Sheffield 1.
5 Aug., 1955. (T 788)

ATOMIC ENERGY RESEARCH ESTABLISHMENT
Harwell

has a vacancy for a TECHNICIAN in its Engineering Service Division. He will be required to assist the Engineer Control Officer in the operation of large scientific plants.

Applicants should have served a recognised apprenticeship, preferably in electrical engineering, and have had good general experience of electrical and electronic equipment. Some knowledge of high vacuum plant would be an advantage. Possession of an Ordinary National Certificate, or equivalent qualification is desirable.

The successful candidate will be appointed with the grade of Technical Class, Grade II, within the salary scale £710 (linked to age 30)—£830 per annum. He will be required to join the Authority's contributory superannuation scheme.

A house will be available within a reasonable period for the selected officer if he is married and at present lives outside the radius of the Establishment's transport facilities.

Requests for Application Form should be sent on a Post Card to the Establishment Officer, U.K. Atomic Energy Authority, A.E.R.E., Harwell, Didcot, Berks, quoting 2/103/349. (T 851)

MINISTRY OF TRANSPORT AND CIVIL AVIATION

require in London MECHANICAL and ELECTRICAL ENGINEERING DRAUGHTSMEN for work on aviation telecommunications projects. Applicants must have experience of (*a*) mechanical detailing of light current electrical engineering assemblies, (*b*) electronic circuit design or (*c*) telecommunications equipment rack assembly and layout. Preference given to candidates with working knowledge of I.D.P./13 Specification governing preparation of drawings. O.N.C. in Electrical Engineering, C. and G. Certificates in Telecommunications or Radio, or equivalent qualifications an advantage but not essential. Salary from £442. 10s. at 21 to £695 (men) and £626 (women). Women's pay being improved under equal pay scheme. Apply any Employment Exchange quoting Order No. Westminster 3753/AC. (T 747)

CENTRAL ELECTRICITY AUTHORITY
Midlands Division

SHIFT CHARGE ENGINEER required at Ocker Hill Generating Station. N.J.B. service conditions, superannuable appointment, salary within Schedule "A," Grade F7, £755 to £800 per annum. The station will be shortly reclassified to Class G.

A sound technical training and practical experience in the control and operation of steam generating plant and main switchgear is required. Appropriate qualifications an advantage.

Apply, quoting Vacancy No. 45MD, on form AE6, available from Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 10 Sept., 1955. (T 906)

LONDON ELECTRICITY BOARD

DEMONSTRATOR

APPLICATIONS are invited for the above position in the St. Marylebone/St. Pancras District.

Applicants should be suitably qualified, holding the E.A.W. or other approved certificate including electrical housecraft, and have experience in conducting demonstrations at Service Centres and in general Service Centre duties. They should also be experienced in advising consumers on the selection and use of domestic appliances, both at the Service Centre and on consumers' premises.

The post is graded within the National Joint Council agreement (Administrative and Clerical Grades) as Grade 1, i.e. £425 to £525 per annum, plus the appropriate London Area Allowance.

Application forms obtainable from Personnel Officer, 46/7 New Broad St, London, E.C.2, to be returned completed not later than 7 Sept., 1955. Please enclose addressed envelope and quote ref: V/2034/T. (T 881)

CENTRAL ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

GENERAL ASSISTANT ENGINEER
NORTH WILFORD POWER STATION

Vacancy No. 134/55/ET

The duties of this position are mainly to assist in the Station Control Room on shift, and to carry out such other operation and investigation duties as may be required.

Applicants should have had some previous experience in a Generating Station and preference will be given to those who hold the Higher National Certificate, or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class K, Grade 15 (£595 x £15—£640 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 6 Sept., 1955.

SENIOR DRAUGHTSMAN (CIVIL)
CONSTRUCTION DEPARTMENT

Vacancy No. 135/55/ET

Candidates should have experience in the preparation of detail drawings and in the design of one or more of the following subjects:

Reinforced concrete structures,
Piled and slab foundations for heavy components,
Cable subways, Bridges and Culverts.

The salary will be in accordance with Grade 4 (£750 x £20—£850 per annum) or Grade 5 (£640 x £20—£740 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications 6 Sept., 1955.

GENERAL ASSISTANT ENGINEER
LEICESTER POWER STATION

Vacancy No. 136/55/ET

Duties will be in the Boiler House and Control Room. Qualifications up to Higher National Certificate standard would be an advantage.

Salary will be in accordance with Class H, Grade 16 (£475 x £15—£520 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 6 Sept., 1955.

SENIOR DRAUGHTSMAN (ELECTRICAL)
TRANSMISSION DEPARTMENT

Vacancy No. 137/55/ET

Experience on H.V. Electrical Equipment associated with Substations and Transmission Systems, including preparation of Electrical Diagrams, preferred but is not essential.

Salary in accordance with Grade 5 (£640 x £20—£740 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications 6 Sept., 1955.

STATION CLERK
CASTLE DONINGTON POWER STATION

Vacancy No. 133/55/ET

Candidates should have had experience in the administration work of a generating station, including stores accounting, calculation and payment of wages and work in connection with suppliers accounts.

The salary will be within Grade 4 (£645/£720 per annum) of the National Joint Council Agreement.

Closing date for receipt of applications 6 Sept., 1955.

STATION CHEMIST
CASTLE DONINGTON POWER STATION

Vacancy No. 143/55/ET

Candidates should preferably be Associates of the Royal Institute of Chemistry or hold an equivalent qualification and have had previous experience in a position of responsibility in a Power Station laboratory.

Candidates should be familiar with the analysis of coal, oil and water and with the interpretation and application of the analytical results. Experience with problems arising from operation at high pressures and temperatures and with the solution of such problems is desirable.

Salary will be in accordance with Class L, Grade 7 (£1,035/£1,125 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 13 Sept., 1955.

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SHIFT CHARGE ENGINEER
LEICESTER POWER STATION

Vacancy No. 142/55/ET

Candidates should be in possession of the H.N.C. in Electrical Engineering or equivalent and have had previous experience in the operation of a large pulverised fuel fired Station.

Salary will be in accordance with Class H, Grade 7 (£840 x £20—£900 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 13 Sept., 1955.

SENIOR DRAUGHTSMAN (MECHANICAL)
GENERATION (CONSTRUCTION)
DEPARTMENT

Vacancy No. 144/55/ET

Candidates should have experience on one or more of the following:

(i) Design and layout of Power Station equipment, including turbo-alternators, boiler plant, coal and ash plant and general station auxiliaries.
(ii) H.P. and L.P. steam and feed pipework. Condensing plant and feed heating systems.
(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

Salary will be in accordance with Grade 5 (£640 x £20—£740 per annum) or Grade 4 (£750 x £20—£850 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications 13 Sept., 1955.

These appointments will be pensionable within the terms and provisions of the Central Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.

19 Aug., 1955. (T 900)

HER MAJESTY'S OVERSEA CIVIL SERVICE

APPLICATIONS are invited for the following post:

POWER STATION SUPERINTENDENT, ADEN

Duties are to take charge of the operation and maintenance of a 20,000 kW oil burning steam station. Appointment is either to pensionable establishment or on contract in the salary range £960/£1,788 commencing salary according to experience. A gratuity of £25 or £37. 10s. for each completed period of three months service is payable on satisfactory completion of contract.

Free first class passages are provided for the officer, his wife, and up to 4 children under 18 years of age. Government quarters are provided at a rental of 10% basic salary. Generous leave and limited free medical attention.

Candidates must be A.M.I.MECH.E. and should be experienced in operation of Steam Station of comparable capacity, with a sound knowledge of generation at 6·6 and 11 kV.

Further details on application in writing to the Director of Recruitment, Colonial Office, Sanctuary Buildings, Great Smith St, London, S.W.1, quoting reference number BCD 145/2/01. (T 850)

NORTHAMPTON COUNTY BOROUG EDUCATION COMMITTEE
College of Technology

Principal: E. Jewitt, B.SC.(ENG.)., M.I.E.E.

APPLICATIONS are invited for the post of Grade B ASSISTANT to teach Electrical Engineering subjects to Higher National standard.

Candidates should hold a degree or an equivalent qualification.

Further particulars and application form can be obtained from the undersigned.

H. A. SKERRETT,
Chief Education Officer.

"Springfield,"
Cliftonville,
Northampton. (T 922)

CENTRAL ELECTRICITY AUTHORITY
North West, Merseyside & N. Wales Division

VACANCY No. E.218/289/T—SHIFT CHARGE ENGINEER, St. Helens Generating Station. Salary £715/£760 (E.7).

Vacancy No. E.218/296/T—ASSISTANT SHIFT CHARGE ENGINEERS, Stuart St Generating Station, Manchester. Salary £755/£800 (H.9).

Vacancy No. E.218/293/T — SHIFT CHARGE ENGINEER, Chadderton "B" Generating Station. Salary £790/£850 (G.7).

Vacancy No. E.218/294/T — SHIFT CHARGE ENGINEER, Greenhill Generating Station. Salary £715/£760 (E.7).

Vacancy No. E.218/297/T—ASSISTANT SHIFT CHARGE ENGINEERS, Bold, Nr. St. Helens. Salary £715/£760 (G.9).

Vacancy No. E.218/299/T — SHIFT CHARGE ENGINEERS, Huncoat. Salary £755/£800 (F.7).

Vacancy No. E.218/300/T—CONTROL ENGINEERS, Huncoat. Salary £635/£680 (F.10).

Applications to Divisional Secretary, Central Electricity Hse, 825 Wilmslow Rd, Manchester 20, before 3 Sept. (T 905)

ELECTRICAL ENGINEERS (DISTRIBUTION)

required by the Central Electricity Board, Malaya, on contract for one tour of three years with gratuity of £200/£280 a year. Opportunity of terminating appointment after one year's service. Salary scale (including expatriation pay and present temporary allowance at rate for single men) equivalent to £1,197 rising to £2,100 a year. Commencing salary according to qualifications and experience. Additional temporary allowances totalling £210/£399 a year (married men), and £301/£630 (family men). Free passages. Liberal leave on full salary. Candidates must have had sound training in electrical and mechanical engineering with experience in the operation of medium Electricity Supply Undertakings and possess a competent knowledge of the maintenance of high and low tension overhead and underground a.c. distribution systems and substation plant. They should preferably be Corporate Members or Graduates of the Institution of Electrical Engineers or possess degrees or other qualifications carrying exemption from the Institution's Graduate examination. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/40440/EE. (T 855)

SOUTH OF SCOTLAND ELECTRICITY BOARD
Central Area

GENERAL ASSISTANT ENGINEER—SOUTHERN DISTRICT

APPLICATIONS are invited for the above superannuable appointment for which candidates should have experience in urban and rural electricity distribution work and preferably a Higher National Certificate in Electrical Engineering.

The conditions of service will be in accordance with the N.J.B. Agreement and the salary as per Schedule A, Class E, Grade 11—presently £555 x £15 to £600. The successful candidate will be required to reside within a reasonable distance of the District Office at Bathgate.

Applications forms, which can be obtained from the undersigned, are to be lodged not later than Saturday, 3 Sept., 1955.

J. G. CURTIS,
"Woodland," Area Manager.
St. Ninians Rd, Stirling. (T 868)

EASTERN ELECTRICITY BOARD
Northmet Sub-Area

FITTER (ELECTRICAL)—HENDON DISTRICT

RATE of pay, at present 4s. 5d. per hour for a 44-hour week, and conditions of service will be in accordance with the N.J.I.C. Agreement for the Electricity Supply Industry.

Apply, by letter, within 14 days to the District Manager, Eastern Electricity Board, 137/9 Brent St, Hendon, London, N.W.4. (T921)

SOUTH OF SCOTLAND ELECTRICITY BOARD
Glasgow Area

APPLICATIONS are invited for the appointment of SENIOR ASSISTANT ENGINEER (Operation and Maintenance) in this Area.

Applicants should have had considerable general experience of public electricity supply in densely loaded commercial, residential and industrial areas and be capable of taking charge of the operation and maintenance of the 300 MW distribution system (33, 20, 6·6 kV and L.V.) in Glasgow and of supervising the work of the District Engineers.

Corporate Membership of the Institution of Electrical Engineers would be desirable.

Salary—N.J.B. Class K, Grade 4 (£1,195/£1,300 per annum).

The post is superannuable and the successful candidate may be subject to medical examination.

He will also be required to reside within a reasonable distance of the Area Headquarters.

Form of application, which may be obtained from the undersigned, should be completed and returned not later than 10 Sept., 1955.

A. KELSO,
P.O. Box 6, Manager.
75 Waterloo Street,
Glasgow, C.2. (T903)

CENTRAL ELECTRICITY AUTHORITY
South Eastern Division

GENERAL ASSISTANT ENGINEER (Chemist) required at Croydon A and B power stations. Applicants should possess Ordinary National Certificate (Chemistry) or equivalent qualification and possess a sound knowledge of elementary chemistry. N.J.B. conditions of service and salary Class K, Grade 18 £500 to £546 p.a. Detailed applications should be sent to Station Superintendent, Croydon B Power Station, Beddington Farm Rd, Croydon, Surrey, to arrive by 3 Sept. (T 902)

MIDLANDS ELECTRICITY BOARD

ENGINEERING DRAUGHTSMAN required at the Worcester and District Sub-Area Headquarters.

Applicants should have had a good general and technical education and practical experience in one or more of the duties involved, which will include preparation of engineering drawings, electrical diagrams, substation site and layout plans, mains and statistical records.

Salary £510/£630 per annum (N.J.B. Schedule "D," Grade 6). Superannuable.

Apply in writing, within fourteen days, stating age, education qualifications, experience and present position to Mr R. Mallet, Sub-Area Manager (Ref: RM), Midlands Electricity Board, Whittington, Worcester.

A. STEPHENS,
Secretary.
(T 920)

A QUALIFIED DEVELOPMENT ENGINEER is required for interesting work on electro-mechanical Instrument Equipment. Applicants should hold Higher National Certificates in electrical and/or mechanical engineering, preferably with some experience of Airborne Equipment operational requirements, and should be able to develop experimental apparatus to production design form. Apply, stating age, qualifications, experience and salary required, to—Box No. 4765, Electrical Times. (T 927)

APPLICATIONS are invited by a firm in the North West for the position of a TRANSFORMER DESIGN ENGINEER. The work covers all types of distribution and medium power units. Applicants should hold a University Degree or H.N.C. in electrical engineering. A sound engineering training is essential for the position, which holds good prospects. Salary, depending on experience, in the order of £1,000 to £1,100 per annum. Full particulars, age, etc.—Box No. 4759, Electrical Times. (T 916)

AIR MINISTRY require MECHANICAL and ELECTRICAL ENGINEERS in Works Department for design, operation and maintenance of mechanical and electrical services on R.A.F. stations at home and overseas and Civil Aviation stations. Appointments in two grades (*a*) Main Grade, salary scale £1,118/£1,463, (*b*) Assistant Grade £729/£1,118. Starting pay according to qualifications and experience. Salaries somewhat lower in provinces. Appointments non-pensionable but with long term possibilities. Special allowance up to £1,500 a year, according to location, payable in addition to salary during overseas service. Candidates must be natural born subjects of natural born British parents and age 25 or over. MINIMUM qualifications and experience for both grades of posts: (i) (*a*) University degree or equivalent diploma in electrical and/or mechanical engineering with at least 2 years apprenticeship; or (*b*) Graduate or corporate member of I.E.E. with at least 3 years apprenticeship; or (*c*) Graduate or corporate member of I.MECH.E., appreciable electrical engineering experience with at least 3 years apprenticeship. (ii) Have been employed for minimum of three years with well established engineering concern and gained wide experience in both electrical and mechanical engineering practice. Application forms quoting reference D240/5A from M.L.N.S. Technical and Scientific Register (K), 26 King St, London, S.W.1. (T 889)

AGENT required by well known Domestic Appliance Manufacturers to cover the Scottish Area. Wide experience of the Wholesale Trade, Electricity Boards and Local Authorities essential. Remuneration by Commission. Must be car owner. Position offers vast scope to successful applicant. —Box No. 4755, Electrical Times. (T 897)

AN ASSISTANT to the Chief Engineer required. Applicants should have served a recognised electrical apprenticeship and hold at least H.N.C. in Electrical Engineering. Some mechanical and civil engineering experience is desirable. Halesowen, Birmingham, area. Apply stating age, qualifications, experience, and salary required to Box No. 4753, Electrical Times. (T 888)

APPLICATIONS are invited from Chargehands and First Class LINESMEN experienced on Wood Pole contracts for work in the North of England. Overtime being worked. Enfield Cables Ltd., Claremont Buildings, Eldon Place, Newcastle upon Tyne. (T 862)

ARMATURE AND STATOR WINDERS required. Applicants must have wide experience of A.C. and D.C. work, preferably in Repair Shops. Good permanent positions available to first class men. The Midland Electric Installation Co., Ltd., Cyprus Works, Upper Villiers St, Wolverhampton. (T 841)

ASSISTANT SALES ENGINEER required for London Office of well-known Switchgear and Motor Control Gear Manufacturers. Must have had practical Works experience and theoretical training, and have completed National Service. Previous outside sales experience an advantage but not essential. Please reply giving age, experience and salary required to—Box No. 4761, Electrical Times. (T 917)

BRITISH THOMSON-HOUSTON COMPANY LIMITED has vacancies in its Research Laboratory at Rugby for PHYSICISTS and ELECTRICAL ENGINEERS for development work concerned with the evaluation and application of electrical insulating materials. Candidates appointed would work as members of a team which includes chemists and is engaged upon evolving, and devising realistic methods of assessing, improved insulation for machines and other electrical equipment. There are openings both for graduates and for those with Higher National Certificate. Applicants are invited to write to the Director of Research, British Thomson-Houston Co., Ltd., Rugby, stating age, qualifications and experience (if any) quoting the reference SR.1 (T 860)

INSTRUMENT SALES ENGINEER

A highly qualified Instrument Sales Engineer is required to take complete control of the Sales and Contracts Department of a leading Company's rapidly expanding indicating instrument business.

This position is an important one and consequently open only to an engineer having wide experience in instrument design and sales; and possessing drive, initiative and proven sales ability.

Technical education to Degree or H.N.C. standard is essential and membership of a professional institution would be an advantage.

A four-figure salary will be offered to the successful candidate; but the point of entry will depend upon qualifications and experience.

Consideration will be given to providing housing accommodation if required, and membership of a non-contributory pension scheme will follow the satisfactory completion of a probationary period.

Applications, which will be accorded the strictest confidence, should contain full particulars of candidate's qualifications, previous experience and present position and be addressed to—Box No. 4741, Electrical Times, quoting ref. "Instruments."

(T 823p)

CENTRAL ELECTRICITY AUTHORITY require ENGINEERS in the Station Development Sub-Branch of the Chief Engineers Department, Bankside Hse, London, S.E.1. The duties include the planning of new generating capacity throughout the country, the co-ordination and direction of investigations into sites for orthodox and nuclear power stations and negotiations for statutory and other consents. Candidates should possess an honours degree or the requisite qualifications for corporate membership of the Institution of Mechanical, Electrical or Civil Engineers. A sound engineering or scientific background is essential and it is an advantage to have had experience of one or more of the problems arising in the siting of power stations such as geology and ground exploration, fuel supply, the use of rivers and the effects of heating, the discharge and dispersal of chimney emissions and questions of town and country planning. Starting salaries will depend on qualifications and experience.

Senior Assistant N.J.B. Grade 1, £1,150/£1,500 p.a.

Second Assistant N.J.B. Grade 2, £971/£1,325 p.a.

Third Assistant N.J.B. Grade 3, £908/£1,125 p.a.

Fourth Assistant N.J.B. Grade 4, £709/£893 p.a.

All inclusive of London Allowance.

Applications on Form AE.6, obtainable from D. Moffat, Director of Establishments, Winsley St, W.1, to be completed and returned by 16 Sept., 1955. Quote Ref. AE/659. (T 925)

SWITCHGEAR

JOHNSON & PHILLIPS LIMITED require Senior Draughtsmen for work at their new Switchgear Factory at New Cross, London.

Candidates must be suitably qualified and competent to handle switchgear metalclad and circuit-breaker designs or station design and layout up to 33,000 volts.

Applications giving full particulars of training and experience together with age, to

Manager, Employment Department, Johnson & Phillips Ltd., Victoria Way, Charlton, S.E.7. (T 909p)

CONNOLLYS (BLACKLEY) LIMITED require a REPRESENTATIVE for their Cable Division to call on Electricity Authorities, Contractors, and Wholesalers, etc., in the Southern Area—territory embracing L.E.B., S.E.E.B., S.E.B. and Eastern Electricity Boards. Car provided, superannuation scheme in operation. Applications giving full particulars and salary required will be treated in strictest confidence and should be addressed to the Sales Manager, Connollys (Blackley) Limited, Manchester 9, and marked "Confidential." (T 893)

COSTING and ORDER CLERK required (Female), for Electrical Engineers. Phone: WEL. 5455/6. (T 926)

DESIGNER required with experience of Distribution and Medium Power Transformers up to 5,000 kVA, 33 kV or over. Permanent and progressive position. Salary commensurate with experience and qualifications. Apply, in confidence to Chief Engineer, Transformers (Watford) Limited, Sandown Road, Watford, Herts. (T 892)

DEVELOPMENT ENGINEER (with Degree) required for telecommunication cables and testing equipment. Permanent and progressive position with pension scheme. Please apply, giving full particulars to—Box No. 4743, Electrical Times. (T 824)

DRAUGHTSMEN, SENIOR AND JUNIOR, required by Consulting Engineer, with experience in preparing drawings and specifications for the internal electrical services in hospitals, schools, factories, etc. Salary up to £800 per annum. Apply in writing to Messrs Barlow, Leslie and Partners, 5 Catherine Place, Westminster, S.W.1, giving particulars of age, qualifications and experience. (T 885)

ELECTRIC Lamp Manufacturers have a vacancy in their London Office for person (preferably with electrical background) to be responsible for stock control and production planning. This can prove an interesting and progressive situation for one not afraid of hard work and demands real ability and initiative to co-ordinate requirements of several branches.—Box No. 4731, Electrical Times. (T 799)

ELECTRICAL DESIGN AND DEVELOPMENT ENGINEER required, must be qualified. Experience in design of small and medium switches essential. Position has good prospects and is pensionable. Applicants should be between 30/45 years of age. Apply stating experience and salary required to Arrow Electric Switches Ltd., Hanger Lane, Ealing, W.5. (T 811)

ELECTRICAL DRAUGHTSMAN wanted for both diagram and layout work. Minimum qualifications, Ordinary National Certificate. Minimum age, 23. Salary according to age and experience. Contributory pension scheme and canteen facilities available. Write in confidence to: Resident Engineer, Bowater's Lloyd Pulp and Paper Mills Ltd., Kemsley Mill, Sittingbourne, Kent, marking envelope "Private and Confidential." (T 914)

ELECTRICAL DRAUGHTSMAN wanted aged 25-35. Applicant should be conversant with plant lay-outs, schematic diagrams of connections, machine wiring and connection diagrams, ordering of electrical material and should have National Certificate or equivalent in Electrical Engineering. Permanent position with pension scheme. Apply to Distington Engineering Co., Ltd., P.O. Box No. 8, Workington, Cumberland, giving particulars of experience and salary required. (T 910)

ELECTRICAL ENGINEERS required by large Oil Company for approximately 18 months in Middle East. Should be suitably qualified and must have had experience in heavy industrial construction or maintenance. Bachelor preferred, age limit 35. Good salary and allowances. Write giving details and quoting No. C.19, to Box No. 9041, c/o Charles Barker and Sons Ltd., 31 Budge Row, London, E.C.4. (T 861)

There are vacancies in the Company's Research Laboratory at Rugby in a Group engaged on the development of semi-conductor devices and their associated circuitry. Requirements are for:

(i) QUALIFIED PHYSICISTS or ELECTRICAL ENGINEERS as Senior Development Engineers.

(ii) An ENGINEER to take charge of and organise small scale experimental production, in the Research Laboratory, of small electrical devices.

(iii) QUALIFIED ELECTRONIC CIRCUIT ENGINEERS for the exploratory development of transistor circuits.

(iv) LABORATORY ASSISTANTS with O.N.C. in Physics, Electrical Engineering or Chemistry. There will be staff appointments for suitable applicants.

Applicants are invited to write to the Director of Research, British Thomson-Houston Co., Ltd., Rugby, quoting reference HR. (T 867p)

ENGINEERS and SURVEYORS experienced in the survey and construction of Wood Pole and Steel Tower Overhead Transmission Lines in Scotland. Give details to—Box No. 952, Keith and Co., 137 Princes St, Edinburgh. (T 911)

ENGINEERS required by Consulting Engineers in London for the design of electrical services in a variety of buildings. Ability to draw and prepare specifications essential and previous consulting or contracting experience desirable. Write giving full details of qualifications, experience and salary required to Box ET751, L.P.E., 55 St. Martin's Lane, W.C.2. (T 839)

ENGINEER (Basic Grade) required by the Atomic Weapons Research Establishment, Aldermaston, Berks, to be responsible, under the direction of a senior engineer, for the maintenance, repair and modification of electrical and mechanical plant of a small and novel nature associated with laboratories handling radio-active and toxic materials. Control of a small precision workshop manufacturing items for plant maintenance and to meet Scientists' requirements. The duties will include the supervision of machining involving unusual techniques, requiring the wearing of protective clothing. Applicants should have served a recognised engineering apprenticeship and be corporate members of one of the Institutions of Mechanical or Electrical Engineers or possess exempting qualifications. They should have had experience in the maintenance of general engineering plant with associated equipment.

Salary, £695/£1,065 p.a. (male). Contributory Superannuation scheme. Successful married officers now living outside the Establishment's transport area will be eligible for housing on one of the Authority's estates; until housed a lodging allowance may be payable.

Requests for application forms by Postcard to the Senior Recruitment Officer at the above address. Quote reference 749/49. (T 895)

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ELECTRICAL ENGINEER/DRAUGHTSMEN required by Ashmore, Benson, Pease and Co., Stockton-on-Tees, for complete electrical installation, design, including motor application, control scheme engineering, distribution and cabling. Experience of contract work and estimating an advantage. Maximum assistance given in obtaining accommodation, one house and two flats already available. Pension Scheme, Technical Library and sports facilities available.

Apply stating age, experience, etc., quoting Ref. W, to Staff Personnel Officer. (T 761)

FIRST CLASS Communication DEVELOPMENT ENGINEER wanted for factory North-West London outskirts. 5-day week and pension scheme. 4 figure salary will be paid commensurate with experience. A man with ability, initiative and vision could become Technical Director. Write Managing Director, Box No. 4751, Electrical Times. (T 887)

FIRST Class WORKING ELECTRICIAN required for post in Malta. Applicants should have sound experience of all types of A.C. installations including wiring of public buildings, industrial power and lighting installations together with some experience of estimating, preparation of tenders, supervision of installation work and commissioning of plant. Write stating age, whether married or single and full details of previous experience to—Box No. 4747, Electrical Times. (T 865)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

IMPERIAL Chemical Industries, Ltd., Metals Division, require an ELECTRICAL MAINTENANCE ENGINEER for their works in South Wales.

Candidates should possess at least Higher National Certificate in Electrical Engineering or equivalent and experience with modern Rolling Mill Electrical Equipment, electric furnaces, instruments and ancillary plant desirable. Application forms to be obtained from Staff Manager, Metals Division, Kynoch Works, Witton, Birmingham 6, quoting reference ENG/246. (T 908)

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a. Rolling Mills, Extrusion Presses and Heavy metal production plant.
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d. Steam, Water, Gas and Air distribution schemes. Heating and Ventilating and Air Conditioning Plant.
e. Furnaces of all types in connection with Metal Production.

Technical qualifications of Engineering degree, Higher National Certificate and/or Associate Membership of Institution of Mechanical or Electrical Engineers desirable. Applications for form should be addressed to Staff Manager, Kynoch Works, Witton, Birmingham 6, Quoting Ref. ENG/GEN. 2. (T 891)

INSPECTOR (Electrical). First Class Mechanical Inspector having previous experience in this field required for a small factory in North London producing variety of small electrical components. The position calls for a man having a background of good staff relations as well as the necessary technical ability. Salary £9/£10 per week. Pension scheme and canteen facilities. Write full particulars to—Box E.T. 764, LPE, 55 St. Martin's Lane, W.C.2. (T 913)

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Housing accommodation may be available at a later date. Alternatively the Authority may be able to assist in the purchase of a house and until permanent accommodation is obtained a lodging allowance may be payable.

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METER REPAIRER (Mechanician) required with knowledge of boiler and turbine water and steam flowmeters and pressure gauges. 4s. 5d. hr., N.J.I.C. conditions, including holiday and sick pay schemes, also canteen. Apply to Superintendent, Central Electricity Authority, Stepney Power Station, Narrow St, London, E.1. (T 890)

LONDON E.W.F. Wholesaler invites applications to fill a new post offering considerable interest to a keen man. Applicants must have had experience in the electrical trade and give full particulars. Apply Manager—Box No. 4733, Electrical Times (T 800)

QUALIFIED ELECTRICAL ENGINEER required for work in London. Must possess comprehensive knowledge of electrical installation work in all types of buildings and be fully conversant with the recognised wiring systems and all regulations governing this type of work. Knowledge of building construction and ability to read architects drawings essential. Able to prepare electrical specifications and illumination schemes. 5-day week. Pension Fund. Reply to—Box No. 4757, Electrical Times, giving details of age and experience and quoting reference L/8/55. (T 915)

TECHNICAL SALES ENGINEERS required by Electrical Manufacturers in the Birmingham Area to prepare Estimates and deal with Contracts. Higher National Certificate preferred but not essential in all cases. Excellent prospects for Engineers with Sales initiative and ability to discuss problems with special customers. Write stating age, qualifications, experience and salary required to Box No. 4749, Electrical Times. (T 886)

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(T918p)

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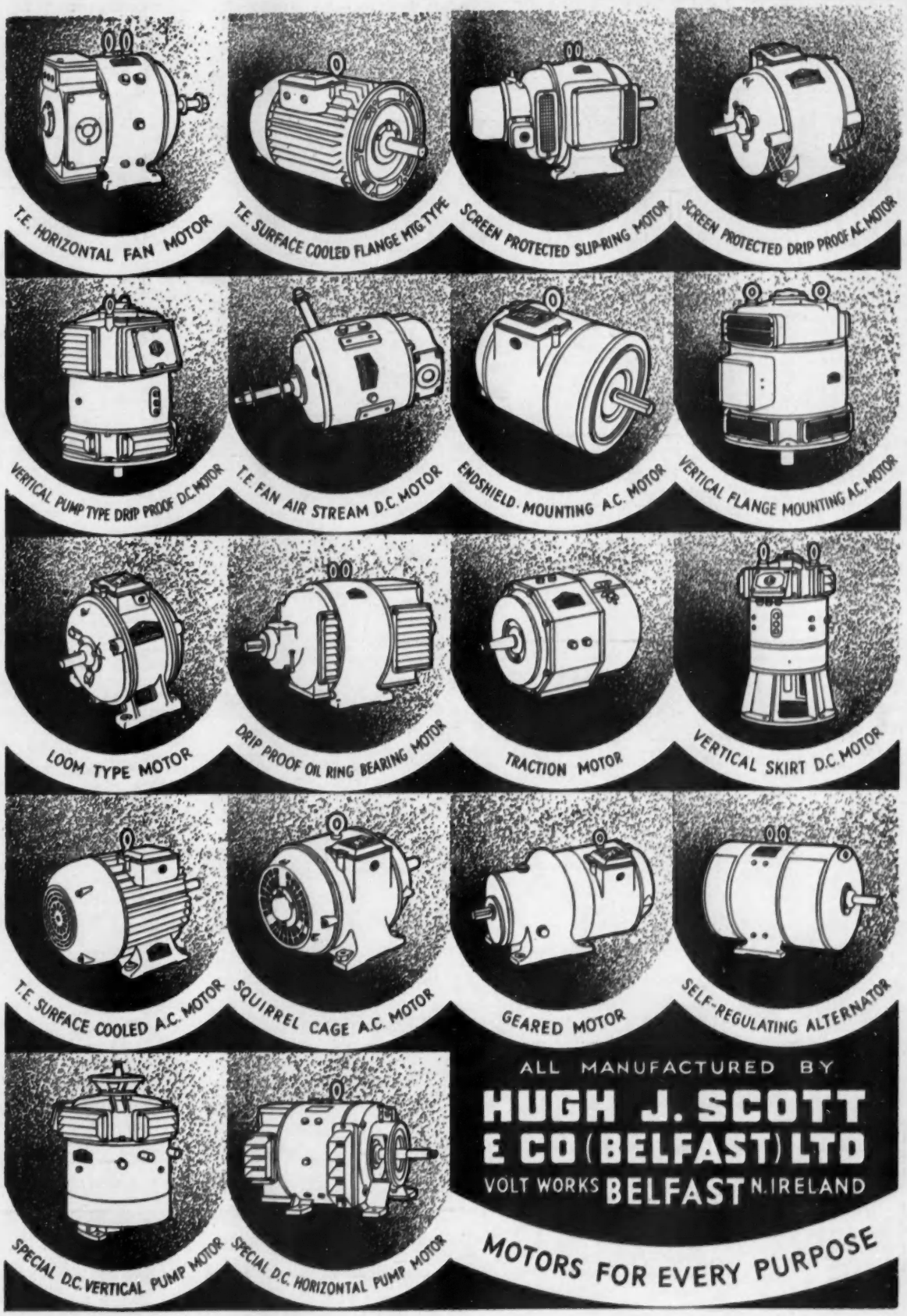
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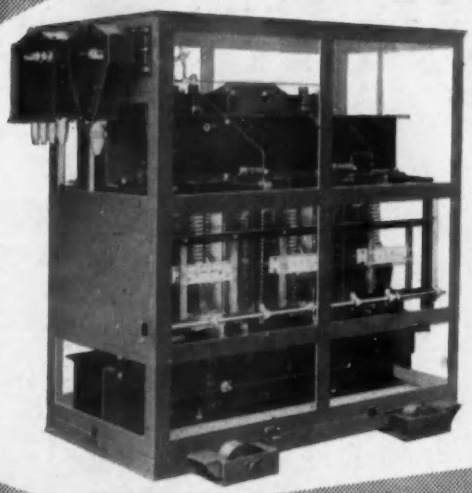

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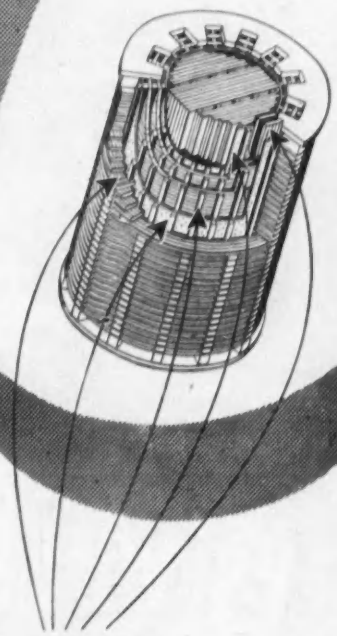

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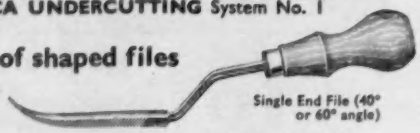

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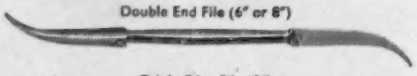

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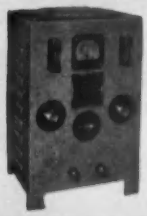

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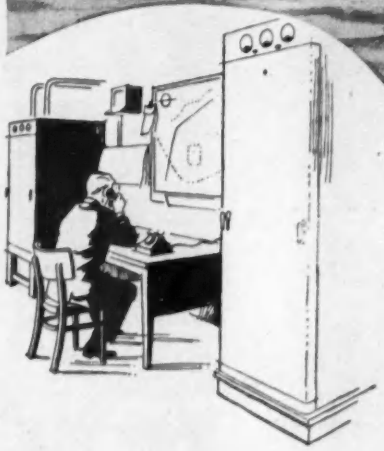

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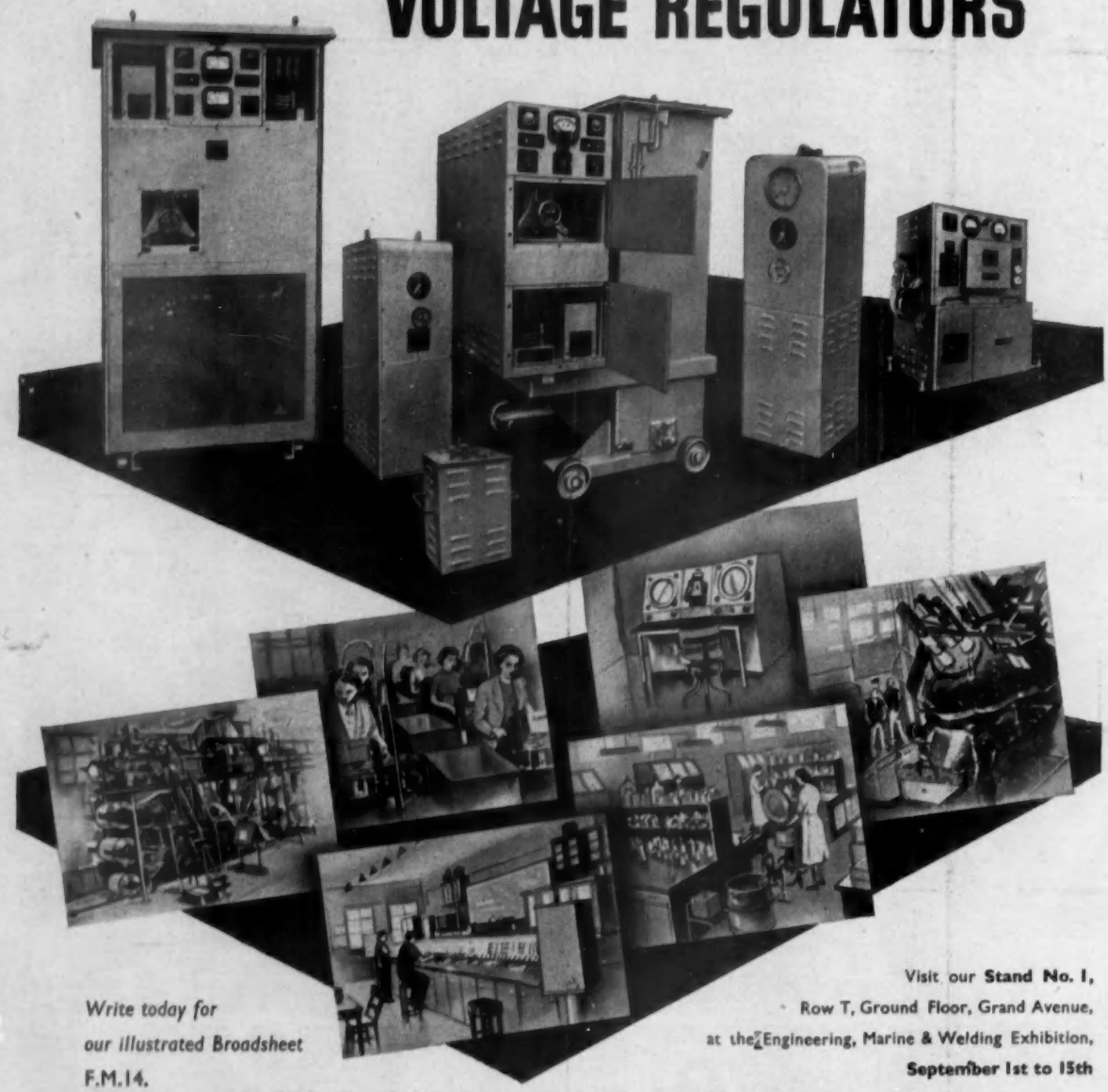

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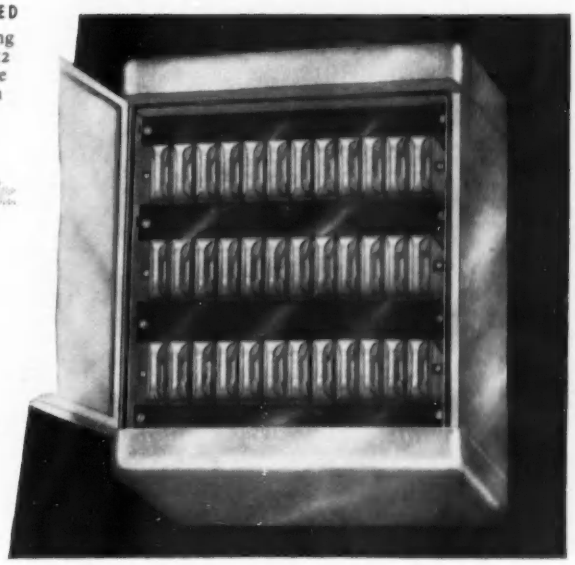

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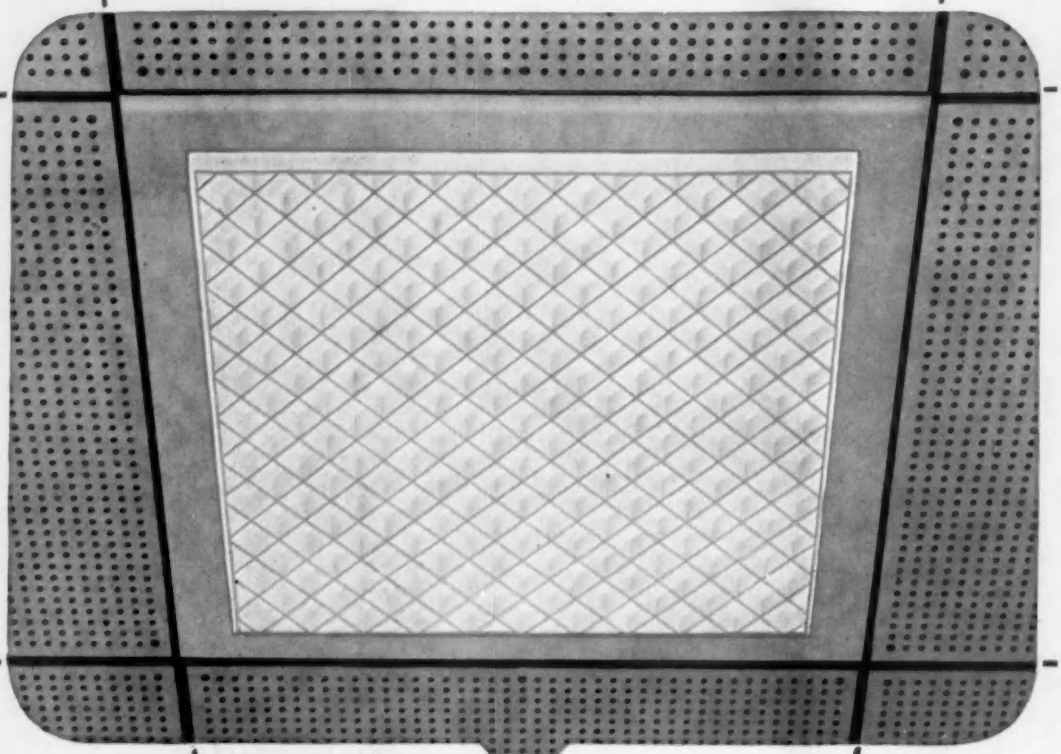

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